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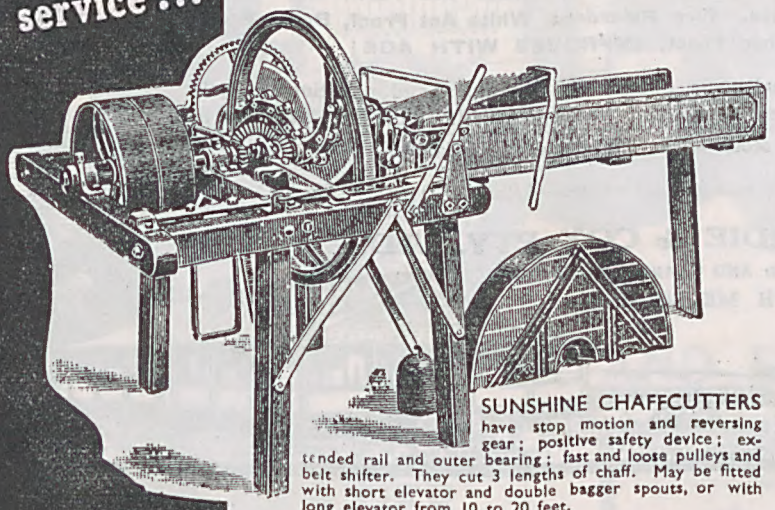

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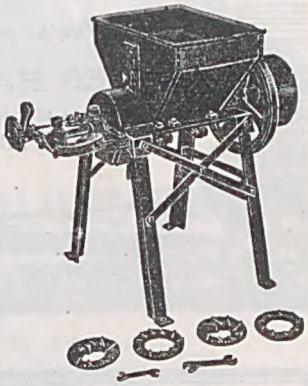

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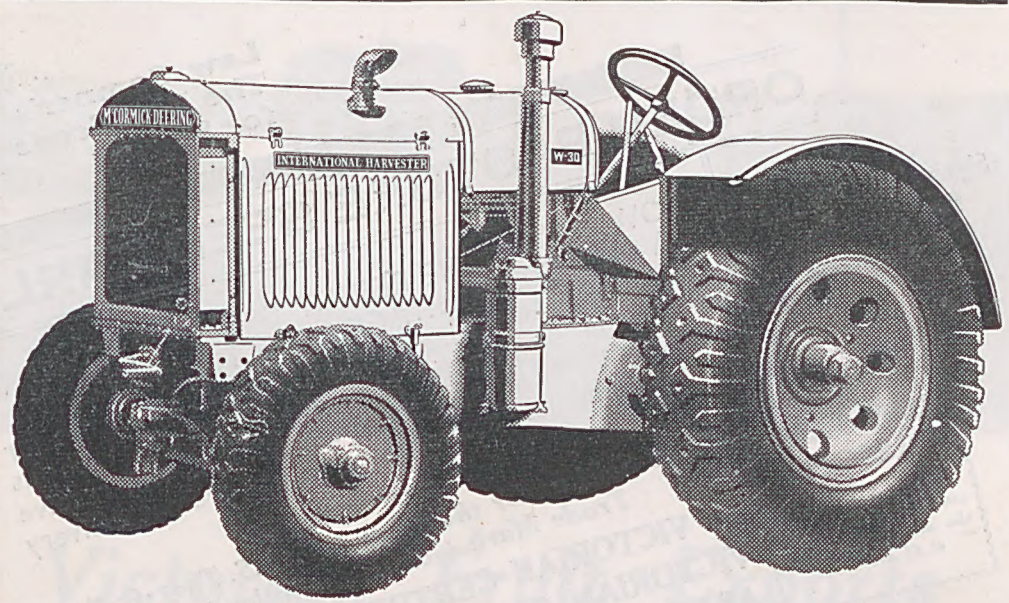

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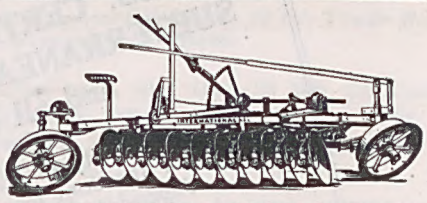

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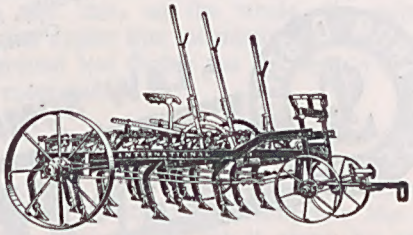

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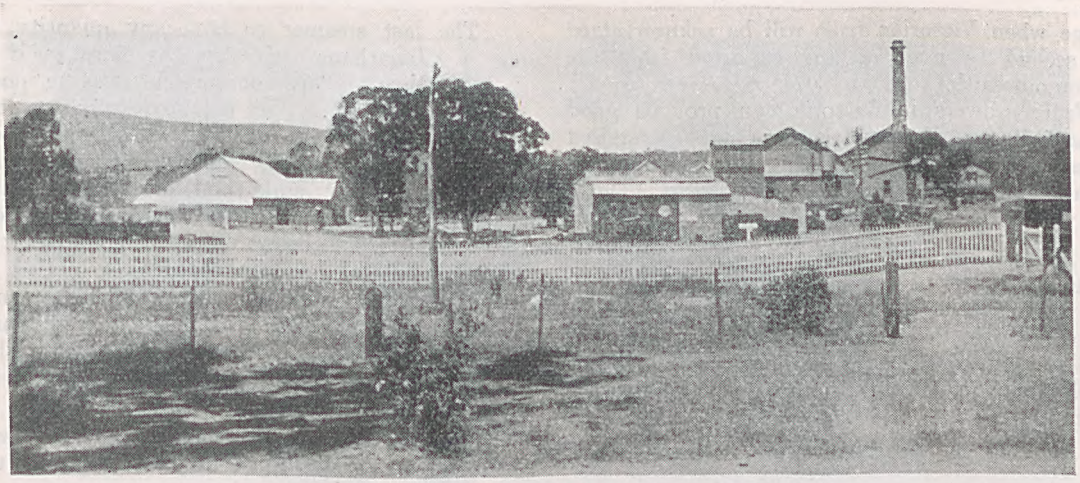

Packing houses and cool stores at Harcourt, Victoria.

Victorian Fruit Exports

Lost Ground Regained

The following report was prepared by Mr. S. R. McColl, Commercial Officer of the Trade Branch of the London Office of the Agent-General for Victoria.

IN my review of the exports of fresh fruit from Victoria to the United Kingdom for the 1937 season, it was stated that certain defects in the condition and quality of some varieties of Victorian apples, noticed in previous seasons, had again been prominent, and in some respects had increased to such an extent as to seriously lower the reputation which Victorian apples had enjoyed in the past. Those remarks applied mainly to the Jonathan variety, and to a lesser extent to Granny Smith, London Pippin, and Cleopatras. The main defect with each of these varieties was severe russeting, which, apart from spoiling the appearance of the fruit, had caused it to wilt, and in many instances, to become quite shrivelled.

In addition, in many packs of Jonathans, the fruit was dull and poorly coloured, with much of it below colour requirements for "Fancy" grade. This fruit also had become shrivelled by the time it arrived in the United Kingdom. Apart from russet, wilt, and shrivel, there seemed little doubt that much of the dull and poorly coloured fruit which became wilted was due to immaturity. Several buyers of Victorian Jonathan apples stated in no uncertain terms that they had been very disappointed with the standard of the Victorian pack, and that, if the condition and quality were not greatly improved, they would be looking elsewhere in the future for their requirements.

It should, therefore, be very gratifying to all concerned with the industry in Victoria, to know that this season there was a big all-round improvement, and that, on the whole, the outturn of Victorian apples was satisfactory. In my opinion, any ground lost during the last season or so, has been recovered.

There is, however, a big responsibility on growers, exporters, and others concerned in the export trade, not only to hold fast to the recovery made, but to still further improve the general average of the pack, for it must be admitted that not all the fruit which came under my notice during the season was without defects. These defects, however, were usually of a type that, with a little more care in selection, grading, and packing could have been overcome, and the standard of the individual pack greatly improved. Growers or exporters, whoever are concerned, should aim to pack above the regulation grades, and continue to improve their pack to the ultimate

stage when Victorian fruit will be acknowledged as second to none of any exported from the Commonwealth.

Fruit growers in Victoria can produce good clean fruit, and if that little extra care is exercised in selection for quality, grading, and packing this result can be achieved.

APPLES.

As the result of personal examinations carried out at both the docks and markets throughout the season, the following summary of the condition and quality of the more important varieties of apples shipped from Victoria this season is submitted :—

Jonathans.

Early arrivals of Jonathans this season were noted for their fresh and attractive appearance. There was only a trace of bitter pit in odd lines, and this defect was usually associated with those lines which were immature and showed little or no colour. The bulk of the fruit was up to grade for colour, although there were quite a few lines of green and poorly coloured fruit which had wilted during the voyage.

As the season progressed, the generally satisfactory condition continued, but in every shipment there was a number of lines with defects in condition, viz. :—

Yellow ground colour, poor colour generally, stale and wilted. Full ripe and bruised —small part slight Jonathan spot.

Severe russet and wilt.

One shipment showed all varieties in a forward condition due to unsatisfactory storage temperatures during transport.

Jonathans particularly were ripe with fair numbers showing slight to moderate Jonathan spot. Several lines were stale in appearance, and others were wilted and shrivelled. Fungal rots were fairly prevalent.

Mid-May arrivals generally showed increasing quantities of forward to full ripe fruit but were in sound condition, with the exception of odd lines showing slight Jonathan spot.

One shipment towards end of May included more fruit in a forward to full ripe condition than otherwise, whilst another shipment, which arrived two days later and took 14 days longer on the voyage, turned out the bulk in a far better condition.

The last steamer to land any quantity of Jonathans arrived in the third week in June. This consignment was in poor condition. Well coloured fruit was full ripe and shrivelled, whilst the poor coloured fruit, below grade, was uniformly stale and shrivelled. Late season varieties, in this steamer, such as Rokewood, Yates, Rome Beauty, were in good condition.

Jonathans generally this year were cleaner and fuller coloured than last year, but there were again many lines in each shipment throughout the season which included many packs below grade with the following defects :—

Part good colour, part below grade, ranging from a few apples in some lines up to 50 per cent. in others.

Dull and poor colour, resulting in wilt and shrivel.

Excess severe russet, resulting in wilt and shrivel.

Excess scab blemish.

Excess hail blemish.

Some codling moth and sting, but these defects were never very pronounced.

Odd lines showed excess spray residue.

These defective packs were usually of a type that, with a little more care during grading and packing, by the elimination of apples below grade, could have been classified as good quality for the " Fancy " grade. Growers and exporters must realize that the inclusion of even a few apples below grade with scab, russet, hail, codling, or other blemishes, lowers the standard of their pack, which could be so easily raised to a higher level.

With regard to colour grading the same position arises with the packer who spoils an otherwise good pack by the inclusion of 5 or 10 per cent. of poorly coloured and even green apples. But there are some packers who continue to make little or no attempt to colour grade their fruit in accordance with the grade standards. Every shipment throughout the season included those odd lines which showed that no attention at all had been given to this matter. The question of colour is closely connected with condition in this variety, and almost invariably it was found that the poorly coloured fruit had wilted during the voyage, while the good coloured fruit opened up in a sound, fresh condition.

I cannot close these comments on Jonathans without making reference to the many excellent packs consistently put up throughout the season by some growers and exporters. Carefully selected

Discharging Australian apples at the Brocklebank Branch Dock, Liverpool.
["Fruit World" photo.

and well graded for colour, these packs demonstrated what could be done by Victorian exporters as a whole. These packs could have been graded as a full "Extra Fancy," and there was certainly no better fruit on the markets from anywhere.

Dunns.

Throughout the season the condition of the Dunns, on the whole, was very good. There was little bitter pit, as only a trace was seen in a few lots, with an occasional mark showing up to 40 per cent. severely affected. At times there was some variation in colour, both green to colouring fruit being noticed in the same case, and now and again an odd line was yellow full ripe, and usually accompanied with a little waste from fungal rots. The quality of this variety was mostly clean and good. The only defects, and these were of minor importance, included codling, excess hail blemish, scab, and russet. Defective lines were the exception, and in the main only a small part of the pack was below grade.

Granny Smith.

This variety was more subject to bitter pit than any other. It occurred in most shipments throughout the season but seldom to an extent serious enough to affect the value of the fruit. Some early arrivals were very green and definitely immature, and this class of fruit was the more seriously affected. Immature lines continued to arrive right up to the end of May, and it would appear that a lot of this fruit was harvested early and kept back for shipment later.

Probably the bulk of the many marks examined throughout the season were sound or showing only a trace of pit, but in practically every shipment a few lots showed severe pit, ranging up to as high as 70 per cent. of the contents of the cases examined. Apart from bitter pit, there were no other faults in condition in this variety until late season arrivals, when green and colouring, and full yellow apples in the same case were noticed. Some of the larger packs of 3-in. size were also full yellow throughout.

While the majority of the many lines examined were up to grade and better, there were many other packs which included apples below grade and on the border line. Apples affected by sun scald, hail blemish, scab and russet, also codling and stings, appeared far too frequently in otherwise good packs. The quality of this variety must be kept at a high standard for a public which is prepared to pay considerably higher retail prices for it. Only clean skinned fruit should be packed as the ideal, and where this is not always practicable, the amount of blemish should be kept down to the lowest possible.

Cleopatras.

The Cleopatra variety was mostly free of bitter pit. A few lines showed a trace, with odd lines up to 10 per cent. severely affected. The condition otherwise was generally green and sound, but some lots included apples green to colouring mixed. Mid June arrivals included several lots yellow full ripe and stale.

The only defect in quality noticed was the inclusion of a few apples in some packs with excess scab blemishes. Generally the quality was clean and good.

London Pippin.

Bitter pit varied from slight to severe in odd lots only of London Pippins. Condition was otherwise green and sound in the bulk of the fruit examined. Some lines included green and yellow mixed, and odd lots yellow full ripe; some of the latter were sound but others were in a stale condition.

With few exceptions the quality was well maintained throughout the season with clean, blemish-free fruit. Some defects noticed included excess russet and spray deposit, codling and mouldy core, excess scab blemish, canary fly blemish, and waste from fungal rots, but these defects occurred only in odd lines and affected a relatively small part of the fruit examined.

King David.

No bitter pit was observed in the King David apples. Condition was uniformly good, and quality mostly good. The only defects noticed in odd lots were:—(*a*) some off-type; (*b*) fungal rots; (*c*) water core and water core breakdown and (*d*) part russeted and shrivelled.

Delicious.

Apples of the Delicious variety showed no bitter pit, but some early arrivals were immature. Condition generally was sound and good, quality clean and mostly up to grade but not outstanding. In fact, throughout the season this variety generally showed very weak and dull colour, with many apples barely making grade.

Rome Beauty.

A few lots of the Rome Beauty apples showed evidence of slight pit, otherwise this variety arrived in a uniformly good sound condition. The fruit was clean and of good quality with the exception that most packs included apples showing a wide variation in colour. In every shipment many lots were noted for the inclusion of a fair part of the pack below the minimum of 10 per cent. colour required. Many of the $2\frac{1}{4}$–$2\frac{1}{2}$-in. popular dessert sizes, as well as the larger sizes, were without any colour at all.

Statesman.

The Statesman variety was mostly in good sound condition, clean and a good quality for grade. A few lots of first arrivals were immature and showing slight pit. Late arrivals included odd lines, yellow ripe, stale, and wilted.

Defects in quality noticed, included excess scab and russet, and weak colour to below grade.

Rokewood.

Odd lines of Rokewood apples were very green and immature, but mostly in good condition, clean and good quality. Defects noticed in odd lines included water core, excess scab, and poor colour. One line towards end of season included a fair portion with slight pit.

Yates.

The Yates generally were of good condition and quality. Defects in quality included severe russet, hail blemish, dry stem ring, and weak colour, but the proportion of fruit affected was relatively small.

Sturmers.

Several lines of early arrivals of the Sturmer variety were very green and immature with a lot of fruit shrivelled; later arrivals were mature and sound. The quality of this variety was clean and up to grade standard, but Victorian Sturmers generally are not true to type as characterized by Tasmanian Sturmers, the apples being far too flat in shape.

Only odd lines of the following varieties came under notice. Generally they were quite satisfactory both in condition and quality, one exception being Ribstons, which were mostly very forward, and showed severe pit and breakdown:—

Democrat, Pomme de Neige, Ballarat, Alfriston, French Crab, Schroeder, Newtown Pippin, King Cole, and Ribston Pippin.

Grading and Packing.

In last year's report reference was made to the unsatisfactory grading and packing of many lines of Victorian apples. Several complaints were made both in regard to the inclusion of undersized fruit, and slack packs. The varieties mainly affected were Jonathans, Yates, and Rokewoods. Apart from the specific complaints received from

buyers, I personally drew attention in my reports of the many faulty lines which came under my notice.

It is gratifying to report that this season's consignments have shown a very marked improvement in all varieties. More attention appears to have been given to size grading, with the result that the fruit has packed better. Although there were not many instances of full crown packs, the cases generally were well filled, and net weights on the average would more closely approximate 40 lb. of fruit than hitherto.

With the arrival of the Yates variety, more faulty packs were observed than in most of all the other varieties together. However, the packing and grading of the Yates was a definite improvement on anything previously seen in this variety. If growers will give just a little more attention in selecting the correct counts for the apples they have graded to certain sizes, there should be no reason for faulty packs at all. The Department of Agriculture has now issued a special packing chart for this variety, and if packers will follow it, there will be no further complaints of "slack packs."

Prices Realized.

During the English winter of 1937, it was expected that large supplies of American apples would be available for marketing in the United Kingdom, at a time when first arrivals of Australian apples would appear. September and October offers of Australian dessert apples (Jonathans, Cleopatras, &c.) at round the figure of 8s. per case C.I.F. and E. were not taken up by buyers with any enthusiasm. In fact it is understood very little business resulted. At a later date apples were offered at considerably less, and in late February and early March many packs of Australian apples were offered in London at 6s. 9d. to 7s. per case.

When the first Australian apples arrived in April, U.S.A. Winesaps were selling at 7s. to 8s. 3d. per case. The Australian apples opened up in splendid condition; bitter pit, which has such an influence on market values, fortunately was almost negligible. The quality of the apples was clean and fresh, and the coloured dessert varieties showed better and more uniform colour than many first arrivals in immediate past seasons.

The position which intrigued the minds of many of us was the effect this sound Australian fruit would have on the American Winesaps. The result was a reaction in favour of the Australian fruit, with buyers eagerly awaiting further arrivals. American Winesaps, which were realizing less than purchase price, were unwanted, and arrangements were at once made to discontinue further buying. Some attempt was made by United States exporters to ship against a guaranteed advance, and even on consignment, but little or no business resulted. The American competition was finished for the time being at least.

Grading and packing apples at Stanley.

Jonathans opened in London at 7s. 6d. to 9s. 9d., according to size. Dunns, Cleopatras, London Pippin around the same figures to a little better, and at these prices the fruit sold well. Prices continued steady until towards the end of the month when they appreciated slightly, and by the end of May, with arrivals never in excess of demand, best dessert varieties were realizing from 10s. to 12s. per case.

It should be noted here that the position of the orange market gave a big filip to the apple trade. Owing to the early cessation of the Jaffa season and to the difficulty in securing oranges from Spain, prices for oranges rose to such high values as to make the purchase of them by the ordinary householder a luxury. People just left oranges alone for the time, and purchased fresh season apples, which were most attractive. As new shipments of apples arrived, they sold well and were quickly consumed. Another factor then occurred to further favour Australian apples. Exceptionally mild weather in February and March resulted in an early blossoming of English fruit trees, with the result that late frosts in May did incredible damage to the young fruit.

The strawberry season, which normally opens about the beginning of June, was a failure, and berry fruits generally were likewise. This resulted in a longer period of stability for apples prices, which, with the exception of a slight decline following the early June bank holiday, continued to improve until by the middle of June, best dessert varieties were ranging from 10s. to 12s. per case, with Granny Smith and Cox's Orange Pippin in good sound condition at higher values. Granny Smiths, as in former years, were always a good trade opening at 12s. to 14s. per case, and retaining a very even level practically throughout the season. Strawberry, berry, and soft fruits from both English and Continental suppliers eventually came on the market in fairly heavy supplies during last week of June, but the season was a relatively short one, and prices for apples were not greatly affected, but the pear market suffered a decline during this period.

One other influence must be mentioned as an important contributory factor in stabilizing apple prices at satisfactory levels. Last year it was pointed out that for the six week period 18th May to 23rd June, over 2,250,000 cases of Australian apples arrived in the United Kingdom, and this quantity was more than half of the total exports in a season of twenty weeks. Normally, this period coincides with the marketing of the home-grown berry fruits, and invariably when this is so, prices fall to bankruptcy levels. Good quality Jonathans in sound condition last season seldom realized better than 6s. 6d. to 7s. 6d. for wanted sizes with $2\frac{3}{4}$ inch as low as 4s. 6d. per case. Although the comparative failure of the English berry fruits this season altered the position to some extent, *it is considered that the more even spread of arrivals of Australian apples was a very important factor in enabling* the fullest advantage being taken of the unfortunate loss of the home growers.

The following particulars of weekly imports of apples into the United Kingdom, as published by the Fruit Intelligence Section of the Imperial Economic Committee are submitted for your information.

APPLE IMPORTS FROM AUSTRALIA.

	1937.			1938.		
Mar.	30	..	22,000	Mar.	29	..	..
April	6	..	114,000	April	5	..	114,000
	13	..	46,000		12	..	31,000
	20	..	138,000		19	..	205,000
	27	..	121,000		26	..	266,000
			441,000				616,000
May	4	..	196,000	May	3	..	404,000
	11	..	284,000		10	..	207,000
	18	..	398,000		17	..	321,000
	25	..	385,000		24	..	247,000
June	1	..	537,000		31	..	469,000
			1,800,000				1,648,000
	8	..	315,000	June	7	..	75,000
	15	..	382,000		14	..	201,000
	22	..	229,000		21	..	387,000
	29	..	198,000		28	..	277,000
			1,124,000				940,000
July	6	..	105,000	July	5	..	139,000
	13	..	93,000		12	..	169,000
	20	..	168,000		19	..	77,000
	27	..	73,000		26	..	231,000
			439,000				616,000
Aug.	3	..	43,000	Aug.	2	..	54,000
	9	..	..		9	..	90,000
			43,000				144,000
			3,847,000				3,964,000

It will be observed that last year, 1937, for the period 18th May to 22nd June, when the downward trend of prices occurred, some 2,246,000 cases of apples arrived, as against 1,800,000 during the corresponding period this year. A difference of 446,000 less in 1938, and these were spread over periods which they could best be handled, notably in the early part of the season

arrivals, which this year up to 11th May totalled 1,227,000 cases against 921,000 in 1937, a difference of 306,000 cases.

The weekly arrivals this season worked out very well, apart from the other factors joining to stabilize the apple market. It is suggested that if shipments can be spread as well in future seasons, when favorable conditions as occurred this season will not be present, the full effect of regulating arrivals to meet the consumptive demand of the trade will be more fully realized.

PEARS.

Advices received from the Department of Agiculture, Victoria, show that 360,520 packages of pears including 355,753 bushel cases, 4,617 standard cases, 50 packages each two half boxes, and 100 sets of trays were exported from Victoria in 28 shipments. With the exception of 9,040 bushel cases consigned to Hamburg, the balance of 351,480 packages was consigned to United Kingdom ports as detailed hereunder. The following statement gives the number of packages (including bushel cases and standard cases) exported from Victoria during the last four years.

——	1938.	1937.	1936.	1935.
London ..	233,006	361,926	374,495	306,069
Liverpool ..	69,038	52,271	26,893	13,513
Hull	12,359	14.481	2,450	..
Glasgow ..	..	12,780	6,305	..
Southampton ..	37,077	34,702	..	..
	351,480	476,160	410,143	319,582

Shipments to Southampton and Liverpool included consignments for Glasgow and London respectively, which were delivered ex rail from the ports of discharge. So far as Glasgow is concerned, buyers desire shipment direct to their own port, and if sufficient quantities are available, every effort should be made to ship the pears by steamers with direct contact with Glasgow. This season Glasgow merchants had fair quantities, but all were consigned to Liverpool and delivered ex rail or road to Glasgow.

Last year's consignments of pears arrived in not nearly so satisfactory a condition generally, as those received in 1936. This season 28 steamers were used to carry Victorian pears to the United Kingdom. Of these 19 were classified as landing their cargo in good hard condition; 3 shipments were fairly good—the greater part being in good condition, and the balance forward to ripe; 5

Unloading Australian fruit in the United Kingdom. ["Fruit World" photo.

were classified as "variable"—about equal parts hard and ripe with some waste, and one shipment was unsatisfactory from the viewpoint that, although the pears were sound, the greater part of the consignment was in forward to full ripe condition, due in my opinion to unsatisfactory storage temperatures during the voyage from Australia.

It is of interest to record here that for the first time for several seasons no W.B.C. pears were exported from Victoria. It is considered that Victorian exporters have adopted a wise decision in discontinuing the export of this variety. Even when the pears can be landed in a satisfactory green hard condition, the prices that they will realize must be considered as speculative rather than assured, as South Africa and Argentine are large suppliers of W.B.C., and Australian fruit usually comes on a market already well supplied with the variety.

Generally speaking, the quality of all varieties was uniformly good throughout the season. In the following summary of individual varieties examined further reference is made to this subject.

Howells.

Howells were included in the first shipment and finished with the *Moreton Bay* arrival on the 18th April. The condition of all consignments was consistently good, as in a few instances only were pears noticed in a slightly forward condition. This variety is very subject to superficial skin marking, and this defect has been fairly prominent in previous seasons, but arrival, this year mostly opened up free of this defects

only slight skin marking and some bruising in odd lines being noticed. The quality was uniformly good.

Keiffers.

The first Keiffers were noticed with the *Somerset* arrivals on the 1st May, and the last in the *City of Canberra* on the 2nd July. Generally the condition of this variety was satisfactory, and the quality clean and good. Two consignments opened up in a forward to ripe but sound condition, and another consignment included many lines severely frozen. In one line many pears had turned brown in the core and surrounding flesh areas, but this condition was apparent only when the pears were cut.

Packhams.

The Packhams variety arrived with the first shipment on the 18th March, and finished with the last on the 8th August. With few exceptions during this period Packhams were noted for the satisfactory condition in which they opened up on arrival in the United Kingdom. In two or three consignments only was there any variation in the uniform "green hard sound condition," and in these, the condition of most of the varieties was forward to ripe, due, in my opinion, to unsatisfactory storage temperatures during the voyage from Australia. An example of a faulty consignment is best stated by giving a summary of the condition as classified after examinations at the docks, during discharge, and subsequently on the markets—

Green hard sound condition,
Green, very firm to yellow full ripe,
Yellow full ripe—one lot overripe and showing breakdown,
Green hard, and yellow ripe in different cases in the same pack.

The general average quality of Packhams this season was quite good for "Fancy" grade, under which the bulk was packed, but there were, however, many instances throughout the season, when otherwise good quality packs included a few pears with blemishes to lower the standard of the packs. The principal defects noticed were: excess scab and severe russet, excess blemishes such as limb rubs, scars, &c., and yellow pears with codling and some codling sting.

Beurré Bosc.

Last year the general condition of Beurré Bosc pears was reported as unsatisfactory, as far too many lots in most shipments arrived in a forward to ripe and even overripe condition. In this condition many defects, such as orchard blemishes, stings, and subsequent fungal rots and black spot were brought into prominence, and buyers' complaints were frequent. This year it is well to know that the condition and quality of the Beurré Bosc variety was very satisfactory. There were some lines with defects, but generally the pears opened up in a hard sound condition. Quality was likewise good—the fruit being clean, true to type and good colour. The main defects observed were: excess spray residue, few lots immature in early shipments, undersized—less than 2 inches, full ripe with some waste fungal rots, excess scab and tree blemishes, and stem end shrivelled. This variety, like the Packhams, was exported with the first consignment, and also in the last, in which the condition was satisfactory, but the pears were really past their best, and were showing quite a lot of shrivel.

Josephines.

The Josephine variety was first seen in the *Perthshire* shipment which arrived on the 5th April, and thence throughout the season, including the last consignment. The condition of arrivals up to the *Orcades* shipment on the 8th May was satisfactory, the fruit opening up in a consistently hard sound condition. From this time onwards to the end of arrivals in August, the condition could only be classified as unsatisfactory. The term used here for a consignment of fruit in which part of the consignment is hard and sound, and part ripening to full ripe, is "variable condition" or "very variable condition" and these terms no more than cover the outturn of the Josephines.

Full detailed reports have been made throughout the season in respect to these pears, in which attention has been invited to the fact that Josephines from certain districts invariably arrive in this variable condition, while those from other districts are generally hard and sound. Exporters concerned, it is believed, are fully aware of the position in regard to these pears, and the necessary action to overcome this disability must be taken during harvesting and packing.

Excess russeting, which in some instances reduced the pack from "Fancy" to "Good" grade, was the only fault of any consequence in this variety. The pears generally were good quality for grade.

Winter Nelis.

Arrivals of Winter Nelis pears commenced in mid-April and continued until the last shipment in early August. With one exception, all consignments were noted for consistently green hard

sound condition. The exception was the consignment which included much ripe fruit of all varieties, and in this one the pears opened up in a wide range of condition, as: green hard with few yellow ripe, green forward but very firm condition, and green firm ripe, few waste fungal rots. The quality was uniformly good.

Winter Cole and Madame Cole.

The condition of the two varieties, Winter Cole and Madame Cole was generally satisfactory, being mostly green hard and sound. Several lots opened up slightly forward but very firm, and a few lots yellow full ripe. With the exception that some packs included a small part below grade with excess skin blemishes, the general quality of both varieties was well up to grade.

Glou Morceau.

The Glou Morceau variety was mostly in a green hard sound condition, a few lines being green to coloring and ripe mixed. Skin marking of this variety, so prevalent in previous seasons, was almost non-existent this year. The quality was clean and good.

Doyenne Du Comice.

Only a few lines of Doyenne du Comice pears came under notice throughout the season, and these arrived in a variable condition. One consignment was hard and sound with the exception that several pears were stalk punctured, and the quality below grade with excess tree blemishes and scars. Another lot included many pears collapsed with fungal rots. One line of selected pears packed in half-bushel boxes was worthy of special comment. These arrived in splendid condition and sold on the average (all counts) at 15s. per half box, equal to 30s. per bushel.

Beurré D'Anjou.

Beurré d'Anjou pears were mostly in a green, hard, sound condition, few lots being green, hard, and ripe mixed. The quality was uniformly good.

With the exception that one line of B. Hardy in an early shipment was very immature, the condition and quality of all the following varieties was satisfactory:—

Bussuch; B. Hardy; Broom Park; Vicars; Winter Bartlett.

Grading and Packing.

In my previous comments on the condition of the pear consignments no reference has been made to damage resulting from faulty grading and packing, as this matter can best be dealt with under this heading. It should be noted at the outset that the bulk of the pears throughout the season were well graded, and the packing satisfactory, with several outstanding packs. Reference to these have been made in the separate reports furnished on the respective shipments, as well as the faulty packs, but it is considered, for the information of all, that a general statement in regard to defective grading and packing should be made here.

In some packs the variation in sizing is not accurate enough. While some allowance must be made when pears are packed to counts or sizes, the variation should be within the grades provided by regulation. This is not always done with the result that the packer packing to certain counts or sizes, frequently finds difficulty in finishing his pack to the correct height in the case, with the result that the pack either finishes very tight or very slack. Movement of the pears during transport from the packing shed until they are landed in the United Kingdom results in the pears shifting from their original position and damaging adjacent pears with stalk punctures and rubbing. Fungal rots frequently follow and the value of the fruit is considerably reduced by the time it reaches the buyer.

When consignments arrive in a forward condition this damage is likely to be more severe, and instances of this condition have been seen often during the past season. Even when pears have arrived in a hard, green state, damage from this cause has been noticed.

Many excellent packs of pears arrived from Victoria this season. The packers of these are craftsmen and certainly take a personal pride in the manner in which their fruit is to be presented to overseas buyers. Apart from this personal aspect of doing a good job, I feel sure that their account sales would give the answer to the justification of the little extra care exercised in this function. Too often have I seen cases of pears well packed up to a point, and then the sparing use of woodwool counteracting the good work already done. Pears coming in contact with the bare wood of the lid and the sides of the case near the lid, and rubbing one against the other, are the result of insufficient packing material. Surely an extra handful of woodwool evenly spread over *the whole* of the top of the case is justified, if this damage can be averted.

Another matter requiring the attention of some packers is their attempt to wrap say a $2\frac{3}{4}$ in. to 3 in. pear in a 10-in. paper. It cannot be done properly and pears like Josephine, Winter Nelis and others with rigid stems should be wrapped

Australian fruit in a sorting store at the the docks, London.
["Fruit World" photo.

in papers large enough to give adequate protection to the stalks so as to prevent damage to pears as mentioned earlier. The larger papers would also form a resting pad and further serve to make a tighter pack without damaging the fruit, and prevent movement which now takes place in some packs. Quite a lot of high-grade pears from a certain district is certainly worthy of being packed in the best manner possible, and it is to this fruit, that these comments are mainly directed.

Finally reference has to be made to a practice adopted for the first time, to my knowledge, by several packers this season. Pears have apparently been packed too high in the case, and in an effort to prevent damage during lidding, only the two ends of the cases have been nailed—the centre of the lid being left free to make a bulge. A centre bulge of up to one inch has resulted, and when these pears were examined on arrival in the United Kingdom, more often than not, the whole of the top layer of pears has been bruised, slight in some instances, and severely bruised and even crushed and split in others. This practice cannot be condemned too severely, and action should be taken to prevent a recurrence during next season.

Prices for Pears.

Pears were a good trade throughout the season at satisfactory prices. The market opened at 12s. to 15s. per case for Packhams, Beurré Bosc, and Josephine varieties; Beurré d'Anjou and Beurré Hardy up to 16s., and Doyenne du Comice, for hard, sound, clean quality fruit, up to 18s. Prices appreciated as the season progressed, and by the beginning of June best varieties were realizing as follows:—Packhams, 14s. to 18s.; Beurré Bosc, 12s. to 16s.; Josephine, 15s. to 18s.; Winter Nelis, 16s. to 20s.; and Winter Cole, 14s. to 16s.

These prices continued fairly stable until with the arrival of the delayed berry and soft fruit season in the last ten days in June prices commenced to ease, and best varieties on the 28th June were making:—Packhams, 13s. 6d. to 14s. 6d.; Beurré Bosc, 11s. to 12s.; Josephine, 13s. to 15s.; Winter Nelis, 12s. to 16s.; and Winter Cole, 11s. to 12s.

Prices improved again in July when up to 20s. was made for Winter Nelis, Josephine, and Packham. The season finished on a low level, with the arrival of the *Dunedin Star* pears, which had been transferred at Adelaide from the *City of Brisbane* 22 days out from Melbourne

Books Reviewed

A review of the literature on stock-scion incompatibility in fruit trees, with particular reference to pome and stone fruits. (Foreword by Professor V. H. Blackman, Sc.D., F.R.S.). Technical Communication 9 of the Imperial Bureau of Fruit Production, East Malling, Kent, England, 1937, pp. 113, bibl. 194, 5/-. By G. K. Argles.

It is unnecessary to stress to readers of this Journal the importance of the general relationship between fruit varieties and the stocks on which they are raised, for Victoria is one of the main nursery regions of the world, and discussion of problems associated with this subject has always been rather keen in this community. The publication from the Imperial Bureau of Fruit Production will, therefore, be of interest to many Victorian readers, for it sets out in a clear way the general conception of incompatibility between stock and scion, the phenomena associated with it, and the reasons why the use of clonal rootstocks, that is, stocks raised vegetatively from one original plant, are of importance in producing uniformity of results.

It need hardly be said that particular recommendations made for other countries do not necessarily apply here. The danger of making unsuitable plantings is, however, not great, because at the present time comparatively small new areas are being planted each year in this State. However, the publication may stimulate growers to experiment on the inarching of young stocks into their existing trees, principally, of course, apples on Northern Spy stock, and anything which increases the amount of information made available in this way is of value at the present time.

The frameworking of fruit trees. "Occasional Paper Imperial Bureau of Horticulture and Plantation Crops", 5, 1938, pp. 19 bibl. 26, 1s. By R. J. Garner and W. F. Walker.

This publication, like the one previously discussed, is of more than usual interest to Victorian fruit growers, because, at the present time, we are at the peak of a campaign in which the older and less desirable varieties of apples and pears, principally, are being worked over to new and improved varieties. Four new methods of re-working in which a large number of grafts is inserted throughout the length of existing leaders suitably prepared and only lightly tipped, are described. Methods of this type, of course, have originated largely in south-eastern Australia, and have been practised in Victoria for some years. Nevertheless, this publication is concise and clear, and would be a useful addition to the library of any one interested in reworking. The awl grafting method described is usually known in Victoria as a needle graft, because we generally use a packing needle suitably ground down to a chisel point. This is the method about which the publication says least, because it has not been used extensively in England to date. In Victoria, it is probably the most popular method, and where carefully applied has given favorable results. It seems that where failure has occurred in this country with this rapid method, it has been because the needle has not been inserted down to the woody cylinder at the commencement of insertion, and this has resulted in the scion being pushed into the bark rather than between the bark and the wood.

Stub-grafting is very well described; this method is considered to be slightly superior to that commonly followed in Victoria, in that we have usually cut the lateral back before making the knife cut in the stub. It will be found somewhat more convenient to use the lateral as suggested in this publication as a means for opening the cut during the insertion of the scion, and then removing the unwanted part of the lateral with the secateurs. Although this has been done in Victoria, it is not the usual practice to date.

—F. M. R.

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when engine trouble developed. This consignment of pears was available on the markets on the 8th August, when large supplies of American Bartletts were available. A lot of the Josephines, and some other varieties, were forward to full ripe, but the pears were a slow trade at prices mostly from 8s. to 10s. per case, some up to 12s. Unsold balances a week after discharge had ripened considerably, and these were finally cleared at 6s. to 8s. per case. It was indeed unfortunate for growers and exporters that this shipment was just three weeks too late, as the prices realized were just about half what they would have realized if no mishap had occurred to the *City of Brisbane*.

PLUMS.

Last season 14,129 half-bushel boxes and 2,458 packages each containing 4 punnets of 7 lb. each were shipped from Victoria in 4 steamers, while for the 1938 season, only 8,534 bushel cases and 305 package each of 4–7-lb. punnets were exported in one shipment.

The bulk of the consignment consisted of the Grand Duke and President varieties; there were also fair quantities of Coe's Golden Drop and the Gage varieties. Other varieties included Pickering, Blue Superb, Wickson, "R" (Reine Claude de Bavay), Ponds Seedling.

Taking the shipment as a whole, the condition was satisfactory from a commercial standpoint. With few exceptions the plums arrived on the market in a very firm condition. Some of the varieties showed varying degrees of injection (a brown sogginess), but where this injury was not apparent externally, it did not affect the market value of the fruit. The plums, which were moderately affected with this injury, commenced to get soft and bladdery after a few days, and those which were seriously affected on discharge quickly became brown inside and developed waste.

A few lots of Grand Duke and President arrived on the market in a very wasty condition. Detailed reference to these is made hereunder. The few cases of Wicksons and Ponds Seedling included in the shipment, although firm and sound externally were completely brown inside. This condition was the same as that seen in these varieties in previous years, and it is considered they should not be allowed export.

The following is a short summary of the condition and quality of each variety:—

Grand Duke.

The majority of the many lots examined were full or almost full colored. A few lots varied from 50 to 75 per cent. colour. The condition of all but a few lots was uniformly very firm and sound excepting for a slight injection of the flesh, which, however, did not affect the commercial value of the fruit. Some lots were quite free of this injury. One lot, however, opened up in a very variable condition showing an appreciable quantity of wasty fruit in some cases, while other boxes were sound. This variety presented quite a fresh appearance on the markets, with the bloom still on the fruit. The quality generally was very good.

President.

The President variety was also well colored, the majority of the marks seen being full or almost full colored, with odd lots varying from 50 to 75 per cent. The condition was not as consistently good as the Grand Duke. While many lots were very firm, the more colored lots were less so, and included odd plums beginning to soften. Injection was more prevalent and more severe in this variety than in the Grand Dukes, and in some instances affected practically the whole of the flesh. The result of this injury, after a few days on the market, was apparent in that the plums had begun to develop a soft and bladdery condition. Where the plums had been quickly sold after discharge, the injury had not affected market values. They sold as readily as the better conditioned Grand Dukes, at the same prices. One lot was very disappointing, all sizes showing a lot of waste, due to severe injection and over-ripeness. The quality of this variety was uniformly good throughout the shipment. It was mentioned in my report on last year's shipment of plums that the Grand Duke variety arrived in better condition than the President, and should be exported in preference to the latter where possible. This year's outturn confirmed this recommendation.

Coe's Golden Drop, Green Gage, and Lawford's Gage.

The Coe's Golden Drop, Green Gage, and Lawford's Gage varieties are taken together for all three with few exceptions, opened up in good condition and remained so during the few days they were available on the markets. With the exceptions referred to they were uniformly in a very firm condition, and free from any internal injuries.

The quality was generally good, but an increased proportion of the larger sizes is wanted, as these varieties can be sold for dessert if large enough, at prices above the rate ruling for culinary varieties.

Wickson.

The Wickson plum was of a yellow colour and sound externally, but, when cut, showed internal browning of the whole of the flesh. This variety has arrived in this condition in previous seasons, and has definitely proved unsuitable for export. These were sold at 6s. to 7s. per box, and at these prices they were considerably above their true worth. Faulty fruit of this nature, if there were any quantity, would do much harm to the marketing of the more dependable varieties.

Ponds Seedling.

A few boxes only of Ponds Seedling were seen. They were in a similar condition to Wicksons and are unsuitable for export.

Blue Superb.

One lot only of the Blue Superb variety was seen. It was externally firm and sound but severely injected.

Three parts to full colored, this plum had a fairly attractive appearance.

Pickering.

Of full colour, the Pickering variety was in a very firm condition but showed moderate to severe internal browning. It was quite an attractive plum and sold early for 9s. to 9s. 6d. per box.

"R" (Reine Claude de Bavay).

One line only of "R" (Reine Claude de Bavay) was seen. It was green-yellow with a slight blush and of sound condition except for some slight internal browning. An attractive plum, it should do well in the "Gage" class.

Grading and Packing.

Very little fault could be found in the grading of the several varieties. With an odd exception or two, where large and very small plums under $1\frac{1}{4}$ inches were included in the same box, the sizing was regular. It is suggested, however, that it should be the object of exporters to ship a minimum quantity of the smaller $1\frac{1}{4}$-in. size. The larger plums are those wanted by the trade, and always sell to advantage against the smaller fruits. In some marks there was a noticeable variation in maturity.

This year's plums came forward in three different types of packages, viz.:—The long half-bushel; Australian half-bushel; and the 4–7-lb. punnet package. Questions have been raised as to which type of package is preferred, and whether the plums should be wrapped.

There is a difference of opinion in the trade respecting both questions. So far as the type of case is concerned, my conclusions are that the case is of secondary importance to the condition of the fruit on arrival, and the net weight of fruit which can be packed into the respective cases. Well-conditioned fruit was seen in each of the different cases in question, but it was considered by many merchants that the Australian half-box contained more fruit than the long half-bushel, and would therefore realize higher prices equivalent to the difference in the net weight of the fruit.

These plums are sold at a per lb. rate, and buyers usually reckon on the long half-bushel box not weighing out more than 22 lb. of fruit and less when wrapped. In this connexion, if it is practicable to do so, I would suggest that growers should stencil the net weight of fruit on the box when packed, and not show the gross weight at all, as is the present practice. A request has also been made for the comparative prices of wrapped and packed plums, as against unwrapped and unpacked.

As stated hereunder the wrapping or otherwise of all but the very large plums, has little or no influence on market values, as this type of fruit is sold on a per lb. basis. But packed fruit will certainly make better prices than unpacked for this reason. A box closely but not overtightly layer packed, will contain more fruit, and after being subjected to much handling between the time of harvesting and packing until arrival on United Kingdom markets will open up in a better condition, and present a more attractive appearance, than plums placed loosely in a box. The latter are subjected to movement, causing bruising and wastage from rots. In addition, an unpacked box of plums contains less fruit, and is passed over by the best buyers for the well-packed and attractive looking samples.

The *punnet package* is a very attractive one, and although it undoubtedly has a selling value, only the exporter can tell whether the net returns from plums exported in this package, justify the added cost of packing.

Wrapping of Fruit.

Whether plums are wrapped or not, there appears to be no difference in their condition and appearance on arrival in the United Kingdom. Personally, I can see no advantage in wrapping plums with one exception. The very large fruits of both the culinary and dessert varieties should be wrapped and even more carefully handled than the smaller and less mature plums, as, if any fruit is likely to arrive in a fully mature condition,

the larger plums will, and therefore, require the maximum protection possible. Large plums of even the culinary varieties, if in good condition, will always attract the best buyers and make the top market prices.

One firm has advocated for some years now the desirability of packing large high-grade plums in the South African tray package, and I certainly support the suggestion. One of our Victorian enterprising growers might be prepared next season to try out this pack. It is generally considered in the trade to be unnecessary, and a disadvantage to wrap the small fruit as the net weight in a box is accordingly reduced, and is not compensated for in this class of plum by increased prices.

One other matter in connexion with packing requires comment. Some growers are using corrugated boards, and others only a paper lining. The former practice gives added protection to any fruit, and should be uniformly adopted for plums.

Prices.

The following is a summary of the range of plum prices realized :—

	s.	d.	s.	d.	
Grand Duke ..	8	0	9	0	Some up to 10s. and others down to 4s. for wasty boxes.
President ..	8	0	9	0	
Coe's Golden Drop	7	6	11	0	
Green Gage / Lawford's Gage	10	0	12	0	A few 15s.
Blue Superb ..	9	0			
Pickering ..	8	0	9	0	
Wickson ..	6	0	7	0	Faulty
Ponds Seedling ..	4	0			Faulty

All-Australian Export Lamb Competitions

Result of September Judging

THE Australian Meat Board has announced that the September judging of the All-Australian Export Lamb Competitions resulted as follows :—

Class 1—Lambs sired by Southdown, Dorset Down, Hampshire Down or Shropshire Rams.

Total Number of Entries—28.

Placing.	Name and Address of Entrant.	Breeding.	
		Sire.	Dams.
1st	T. Ridgway, Martin-avenue, Fitzroy, South Australia ..	Southdown ..	Dorset Merino
Equal 2nd	T. Ridgway, Martin-avenue, Fitzroy, South Australia ..	Southdown ..	Romney Merino
Equal 2nd	Prentice and Sons, Prestbury, Southbrook, Queensland	Southdown ..	Lincoln Cross
3rd	W. Muir McFarlane, Port Lincoln, South Australia ..	Southdown ..	Romney Cross Merino

Class 2—Lambs sired by Ryeland, Suffolk or Dorset Horn Rams.

Total Number of Entries—2.

Placing.	Name and Address of Entrant.	Breeding.	
		Sire.	Dams.
1st	C. L. E. Orton, Moora, Western Australia	Ryeland ..	Border Leicester Merino Cross

London Markets

Weekly Prices

The following information as to prices offering in London for the principal Victorian primary products has been taken from cablegrams received each week by the Department of Agriculture from the Victorian Agent-General in London.

Product.	Price for Week Ending—			
	2nd Dec.	9th Dec.	16th Dec.	23rd Dec.
	d.	*d.*	*d.*	*d.*
Lamb, 1st quality, Victorian .. .. 29–36 lb. ..	7¾	7¾	7½	7¼
Lamb, 1st quality, Victorian .. .. 37–42 lb. ..	7¼	7⅛	7	7
Lamb, 1st quality, other States .. .. 29–36 lb. ..	7⅞	7⅞	7⅝	7⅛
Lamb, 1st quality, other States .. .. 37–42 lb. ..	7⅛	7	6⅞	6⅞
Lamb, 2nd quality, Victorian .. .. 28 lb. and under	7⅛	7	6⅞	6¾
Lamb, 2nd quality, Victorian .. .. 29–36 lb. ..	6¾	6⅝	6½	6½
Lamb, 2nd quality, other States .. .. 28 lb. and under	7⅛	7	6¾	6¾
Lamb, 2nd quality, other States .. .. 29–36 lb. ..	6½	6½	6¼	6¼
Lamb, 3rd quality, all States .. .. 28 lb. and under	6½	6⅜	6¼	6¼
Lamb, 3rd quality, all States .. .. 29 lb. and over	6¼	6⅛	6	6
Mutton wethers and/or maiden ewes .. Under 40 lb. ..	3½	3½	3⅜	3¼
Mutton wethers and/or maiden ewes .. 41–48 lb. ..	3⅜	3⅜	3⅜	3¼
Mutton wethers and/or maiden ewes .. 49–56 lb. ..	..	..	..	..
Mutton ewes .. .. Under 40 lb. ..	3⅜	3⅜	3¼	3¼
Mutton ewes .. .. 41–48 lb. ..	..	..	..	..
Beef, frozen ox hinds .. .. .. 145–210 lb. ..	4¼	4¼	4¼	4¼
Beef, frozen ox crops, weights corresponding	3⅜	3¼	3¼	3¼
Beef, chilled ox hinds .. .. .. 145–210 lb. ..	5⅝	5¼	5⅜	5⅜
Beef, chilled ox crops, weights corresponding	3⅝	3½	3⅝	3⅝
Pork, Australian 1st quality .. .. 60–80 lb. ..	7½	7½	7⅝	7⅝
Pork, Australian 1st quality .. .. 81–100 lb. ..	7⅛	7⅛	7¼	7¼
Pork, New Zealand, 1st quality .. .. 60–80 lb. ..	7½	7½	7⅝	7⅝
Pork, New Zealand, 1st quality .. .. 81–100 lb. ..	7⅛	7¼	7¼	7¼
	s.	*s.*	*s.*	*s.*
Bacon, Canadian .. .. .. per cwt. ..	87	89	89	89
Bacon, Empire (cured in England) .. .. per cwt. ..	85	87	87	87
Bacon, Danish .. .. per cwt. ..	95	94	97	97
Butter, unsalted, choicest grade .. .. per cwt. ..	105	106–107	111–112	111–112
Butter, unsalted, 1st grade .. .. per cwt. ..	..	..	110	..
Butter, unsalted, 2nd grade .. .. per cwt. ..	..	..	..	..
Butter, unsalted, pastry grade .. .. per cwt. ..	..	..	..	..
Butter, salted, choicest grade .. .. per cwt. ..	103	104–106	109	108
Butter, salted, 1st grade .. .. .. per cwt. ..	102	104–105	108	107
Butter, salted, 2nd grade .. .. .. per cwt. ..	100	102–103	106–107	105–106
Butter, salted, pastry grade .. .. per cwt. ..	96	96–98	104	103
Butter, Danish .. .. per cwt. ..	140	141	141	142
Market (butter)	Firm	Market closed firm on short available supplies.	Firm	Firm

Incidence of Potato Moth

Survey of Victorian Districts

By R. T. M. Pescott, M.Agr.Sc., F.R.E.S., Entomologist.

THE potato moth (*Phthorimaea operculella* Zell.) is the most serious insect pest with which the potato grower in Victoria has to contend. It was introduced into this State some 70 years ago, possibly in the seed potatoes from Tasmania, or directly from overseas. It is generally accepted that wherever potatoes are grown, either in Australia or abroad, seasonal conditions during the growing period of the crop play a very important part in the incidence of this pest. A hot and dry growing season, such as those experienced in 1935–36 and 1937–38, is very favorable to the rapid increase of this pest, with usually resultant severe damage to the crop. Conversely a cool summer, and particularly one in which late summer rains are experienced, is not favorable for potato moth increase.

Reports of serious damage by potato moth in some districts of the State were received late last season. The following report sets out in detail the results of inspections of all the larger potato producing areas of the State, together with comments on such practices in the various districts as are inimical to the production of clean potatoes in a year in which the potato moth is very prevalent.

Fig. 1.—Showing damage done to leaves and stems by the potato moth.
[U.S. Dept. Agric.

Fig. 2.—Eggs of the potato moth on tubers near the eyes.
[U.S. Dept. Agric.

It is perhaps of value at this point to briefly outline the habits and life history of the potato moth, as certain of the practices to be discussed later have been evolved as the result of a knowledge of the pest.

Injury.

Injury to the potato crop may take two distinct forms—(*a*) to the growing plant, and (*b*) to the tubers.

The growing plant.—The injury to the growing plant is manifested by the larvae or grubs "mining" into the leaf and tunnelling in the stems (Fig. 1). As a rule, the young larvae, hatching from eggs deposited on the leaves, commence to "mine" in the leaf. As these larvae grow, they become too large for "mining" in the thin leaf, and if there is not another leaf nearby to tie up so that they may work in a protected space, they either roll the leaf or enter the petiole or leaf stalk. Once started in the petiole, the larva rapidly works its way to the main stem, which it begins to tunnel. The larva generally works downward in the stem, although in a few

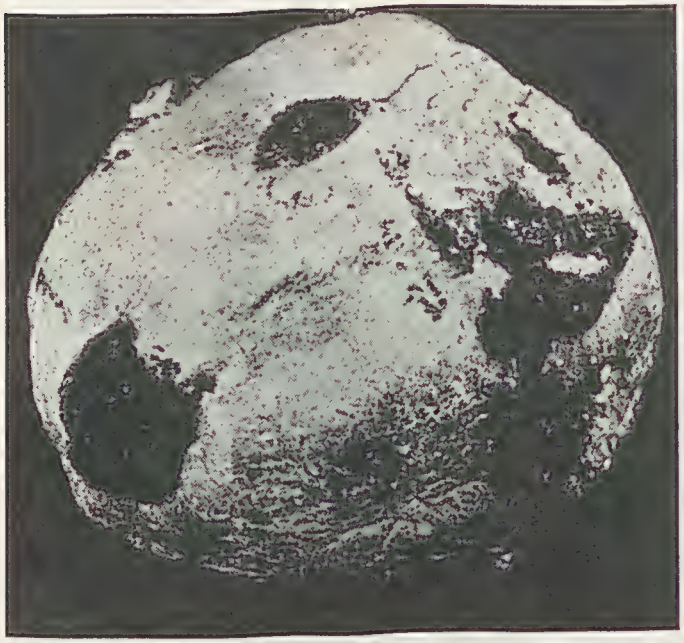

Fig. 3.—Potato moth damage showing at the eye of stored tubers.

[U.S. Dept. Agric.

cases where the stem is thick it may turn and work upward. Where this type of damage occurs generally over a field while the potato plants are young, considerable injury may result to the crop through a general weakening of the plants.

The tubers.—Damage to the tubers may also occur in the field if they become exposed while growing, or if they are allowed to remain in the field any length of time after harvesting. Serious infestation of the tubers may also occur after they have been stored in a shed, bin, or stack. In storage, the insect may continue to reproduce as long as the potatoes contain enough food to mature the larvae or grubs.

Where tubers are infested in storage, the point of infestation is usually at the eyes, where the eggs are actually laid (Figs. 2 and 3). The larvae or grubs at first work just under the skin of the potato, but later tunnel through the tubers, filling the tunnels with excrement and permitting the invasion of the organisms of decay.

Life History.

In the field, eggs are deposited in the spring on the underside of the foliage of young potato plants. Each female moth is capable of producing up to 300 eggs. These eggs may hatch in from 5 to 34 days, depending on temperature conditions. The young larvae or grubs emerging from these eggs are quite active and commence feeding almost at once. They seldom move far from the place where they hatch before they begin to burrow. The period that may elapse in the larval stage will vary from 13 to 27 days, depending on climatic conditions. The fully grown larva measures slightly less than half an inch long, and is pale greenish white in colour.

When the larva is fully grown, it spins a cocoon prior to pupating. This pupal stage may be found in the field, (1) in curled dried leaves on the plant, (2) under clods and rubbish, and (3) protruding from old burrows in the stem. The majority of the pupae, however, will be found in dried leaves clinging to the potato plant. The period spent by the insect in the pupal stage varies from 8 to 56 days depending on temperature conditions. The adult insect, the moth, is generally grey in colour, with a wing spread of a little more than half an inch. The fore wings are more or less spotted and mottled in appearance, while the hind wings are narrower and buff in colour.

Under field conditions, the habits of the moth are well adapted to protect it until eggs are deposited. During the day, the moths hide beneath rubbish, or, if the fields are clean, under clods of earth. They seldom fly in the field during the brighter hours to the day, unless disturbed, and then the flight is short and jerky, and on alighting, they seek concealment. Activity is most marked during warm nights, when egg-laying is most abundant. The majority of the eggs are laid by the fourth night after emergence.

In storage, development may occur throughout the whole year, but is most general during the warmer months. The eggs are usually deposited in the eye or a rough scar on the potato, and as many as thirty may be found in one eye. In sprouting potatoes, the eggs are often placed in circles around the base of the sprout. While it is usual in the field for the eggs to be deposited during the evening, night, or early morning, in darkened bins, and in cool weather egg-laying may take place at all hours of the day. When the eggs on the tubers hatch, the larvae commence to feed at the spot where the egg was laid, since

the irregularity in the surface chosen by the moth for egg-laying affords a favorable location for starting a tunnel. For this reason, the damage to potatoes first becomes evident in the eyes. The fact that the entrance hole is very small and webbed over, makes it difficult to detect infestation in potatoes shortly after the eggs have hatched.

After a few days a pink coloration may be noticed around the injured eye, and closer examination reveals the presence of excrement held in the web at the entrance to the burrow. The larvae first burrow straight through the skin and into the substance of the tuber. Some then turn their mines so that they follow close under the skin of the potato. Later the skin of the potato partially dries and sinks, so that the scar becomes very prominent. This type of damage is the most noticeable, but is not so injurious to the tuber as the deeper channel; and, as it dries out more easily, it is not so apt to be the cause of rot. The channel of the tuber moth larva is, as a general rule, deeper and may even go through the centre of a large potato. This form of injury is more difficult to detect from the outside than the other form and, because of its greater injury to the potato is more important.

The burrows or galleries generally measure 1 to 3 inches in length and are quite winding. The portion occupied by the larva is fresh and white, but the older parts are covered with a matlike brown fungus and often are partially filled with excrement. When the larvae are fully grown in stored potatoes, they may spin their cocoons and pupate in any one of the following places:—(*a*) in the eyes of the potatoes; (*b*) between the potatoes where they actually touch; (*c*) between potatoes and bin walls; (*d*) between potatoes and sacks; (*e*) in folds of sacks; (*f*) in cracks in bin walls; (*g*) in rubbish on floors; (*h*) in the end of burrows where cocoon partly protruding; and (*i*) in old burrows under dry skins of potatoes. There are generally upwards of five or six broods of potato moths in one complete season.

Dissemination.—The tuber moth is disseminated by two means, natural and artificial. Of these, the former, by flight of the moth, is much the slower, and, as it can hardly be controlled, is relatively unimportant. The most important spread of the potato moth takes place through the movement of infested seed potatoes. In this way the insect is assured of an abundance of food.

Ballarat District.

The Ballarat district, for the purpose of this report, comprises the following areas—Ballarat, Clarendon, Scotsburn, Buninyong, Dean, Clark's Hill, Newlyn, Millbrook, Gordon, Wallace, and Bungaree.

The losses in this district were probably greater than in any other, with the exception of Romsey. It was estimated that from 10,000 to 11,000 acres of potatoes were planted in Ballarat in the season 1937–38, and that the average loss due to potato moth alone, would be from 20 to 25 per cent. over all varieties, with considerably greater losses resulting to early varieties, such as Up-to-date and early Carmans. Later varieties, such as Snowflakes, did not suffer so severely, losses ranging from 5 to 10 per cent. of the crop. This fact alone is significant as emphasizing the seriousness of the position this season in this district, as the Snowflake variety is one which is normally not greatly damaged by the moth.

In one instance, at Clarendon, it is considered that a loss of 90 per cent. of a crop of Carmans and 30 per cent. of a crop of Snowflakes resulted on heavy, stony country which in any abnormally dry season must suffer severely. This high percentage loss was partly the result of a very heavy infestation of the growing tops by potato moths during November. These tops were almost completely destroyed, the yield was considerably lowered, and there was a serious carry-over of the insect for the later summer months. The losses really amount to more than is shown by the actual figures above, as a large number of small potatoes, which normally would be used for seed purposes for the following season, were so damaged that their use for seed was, in most cases, impossible.

Field practices which would have a bearing on these severe losses can be considered under the following headings.

Seasonal.—It is undeniable that, in this district, seasonal conditions generally were such as to be against the production of normal crops of potatoes, and, at the same time, favorable to the rapid development of the potato moth. Even though the season was so favorable to potato moth attack, it is felt that if more attention had been paid by some growers to certain other aspects, a reduction in damage would have resulted.

Preparation of Soil.—It was very apparent at the outset that some growers in this district were experiencing little, if any, losses, while other growers nearby were suffering severely. On

Fig. 4.—Potato tubers exposed through the surface in a non-moulded crop.

examination, it was found that one reason for this could possibly be found in different methods of preparation of the soil.

The most successful practice was to make the early plowing quite a deep one, following this up with the broadcasting of a green crop (about March)—say, barley or oats. This was then plowed in at the correct period, so that it would have sufficient time to rot down before the planting of the crop. The potatoes were then planted down on this to a depth of 4 to 5 inches. Particularly in a dry season, this practice is of great value, as it conserves moisture for the following potato crop as well as providing an abundance of green manure. The increased depth of the first plowing is essential if it is proposed to plant at a depth of 4 to 5 inches, and allow of normal growth of the tubers underground.

Where very little attention had been paid to this preliminary preparation for the crop, quite appreciable crop losses were apparent. From a knowledge of the life history and habits of this insect, we know that the moths on the wing during the summer months crawl down any cracks in the soil and gain access to the tubers. With efficient preliminary preparation of the soil, there is much less tendency for the ground to open up and crack than where little attention has been paid to this aspect of the work. Moreover, more efficient hilling can be accomplished later where the soil has been thoroughly prepared. Particularly in a section of the Wallace area, it was the established practice to plant the potato crop "under the sod." While this practice in a normal or wet season may be perfectly satisfactory, in a dry season it is favourable to potato moth damage, by allowing the opening up of the soil, &c.

Depth of Planting. — From the point of view of the control of potato moth, depth of planting is a very important factor, and one which is linked up with the previous preparation of the soil. Generally speaking, the greater the depth at which the potatoes are planted, the less the likelihood of damage. The reason for this is that if the potatoes are planted deeply the tubers that are produced will then be enabled to form well under the surface and be away from the activities of the potato moth. This is particularly necessary with the early variety, Up-to-date, which normally has the habit of producing its tubers close to the surface, and also on side runners. This latter fact must also be borne in mind during hilling operations.

Fig. 5.—A well moulded potato crop at Clark's Hill.

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On the other hand, shallow planting of potatoes (and particularly where not moulded afterwards) tends to produce a larger percentage of the tubers exposed through the surface. These, and particularly in a dry season like the last one, must become affected with potato moth grubs (see Fig. 4).

In the Ballarat district, the depth to which potatoes were planted apparently varied considerably—ranging from 3 inches to 6 inches. Generally speaking, those crops planted to a greater depth (not less than 4 to 5 inches) were less severely attacked than those planted shallower. It appeared, purely from observations only, that a depth of from 4 to 5 inches was the optimum.

Fig. 7.—A non-moulded potato crop at Millbrook severely attacked by potato moth.

Moulding.—The practice of moulding a growing crop of potatoes is one which appears to be well established in the potato industry, and one the importance of which is thoroughly realized. Particularly in a season like the one just completed and also in the drier districts this practice is essential if a crop relatively free from the potato moth is to be obtained. Where a crop like Up-to-date is concerned the moulding must of necessity be shallower and wider than with other later varieties. In the Ballarat district moulding seemed to be well practised and there was a very significant increase in potato moth infection where crops were not moulded. In Fig. 5, for example, is seen a well-moulded crop at Clark's Hill, where, although the ground had been roughly prepared, and was rather cloddy, little damage had resulted. In Fig. 6 is seen a well-moulded crop at Wallace in well-prepared soil, and potato moth losses here (in Carmans) were only in the region of 5 per cent. On the other hand, in Fig. 7, is shown a crop at Millbrook not moulded and very severely attacked by potato moth to the extent of 30 to 40 per cent. The crop on the neighbouring property which was well cultivated and well moulded showed considerably less than 5 per cent. of damage.

Fig. 6.—Another well moulded potato crop, at Wallace, in well prepared soil.

Bagging. — Various field practices which can be considered under the title of bagging have an enormous influence on the future of the bagged crop. It is fairly general practice among growers immediately after bagging the dug crop in the field to place on top of the bag, either before or after sewing, a pile of potato tops. This practice, and particularly

where early dug crops are concerned, cannot be too highly condemned, as grubs present in the tops will fall or migrate into the bag and contaminate otherwise clean tubers. It is a common occurrence amongst inspectors examining such produce to find the top third of a bag severely damaged by potato moth grubs. In Fig. 8 is shown, at Wallace, a typical example of this practice, and in Fig. 9, at Clark's Hill, a case in which the practice has been exaggerated almost to the limit.

A more praiseworthy custom, and one which is directed at reducing tuber infection to a minimum after digging, is to sew the bags as soon as possible after filling, and, then, if they cannot be removed from the paddock that day, to invert them so that the sewn end is in the ground. In Fig. 10 is seen an example of this practice at Bungaree, where the bag on the lefthand side has been sewn immediately and that on the right inverted. In Fig. 11, the photograph being taken at Wallace, this same principle is emphasized with the addition that soil was worked up around any exposed sections of the sewn end of the bag.

Fig. 8.—Potato bags at Wallace covered with haulms.

Sanitation.—There are several field operations that can be considered under the heading of sanitation and they have an important bearing on the crop. For example, potato tops, and particularly early in the season, are a constant source of further potato moth infection. If these are left lying on the ground untreated for any length of time, any grubs present have the opportunity to mature and infect later varieties or bagged potatoes in the field. It would be very advisable and certainly economical to have these tops collected and burnt every evening (wherever possible), and particularly so in the case of Up-to-dates and Early Carmans.

Then, again, the storing up of reject potatoes for any length of time after digging, without their being sorted, is dangerous. Such reject potatoes should be sorted at once, and, if seed is to be taken from them, stored separately. If it is intended to sell the rubbish for stock food, it should be done at once. If it is to be kept for stock food on the farm, it should be used as soon as possible. It was noticed in the Ballarat district, that, whereas a good deal of attention appeared to be paid to the first of these practices, little or no attention was paid to the second.

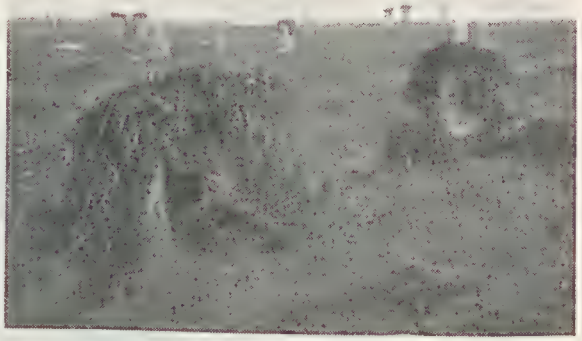


Fig. 9.—An extreme case of covering potato bags with tops actually seen at Clark's Hill.

Host Plants.—It is a well known fact that other plants, apart from the potato, are host plants of the potato moth. This is particularly the case with the Black Nightshade (*Solanum nigrum L.*). While it is usual by cultivation methods to keep a potato crop reasonably free from such weeds, an example was encountered in the Millbrook area, where such attention had not been given. In Fig. 12 is shown portion of a crop at Millbrook, in which the black nightshade was relatively abundant among other weeds and was certainly a contributing factor to the heavy infestation by potato moth.

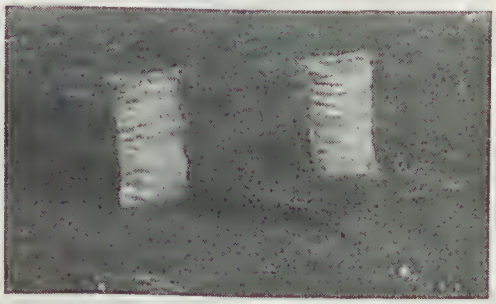


Fig. 10.—Pototo bags at Bungaree sewn at once. Note that the bag on the right has been inverted.

Summary of Ballarat Area.

Losses due to the potato moth in the season 1937–38 were very severe, averaging roughly 20 to 25 per cent. over the whole area and over all varieties.

Seasonal conditions were such as to favour the activities of the potato moth.

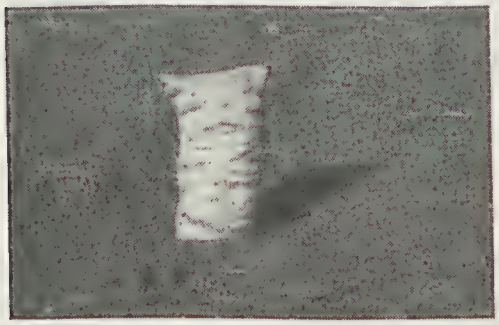


Fig. 11.—A potato bag at Wallace sewn, inverted, and the soil worked up around the sewn end.

While it was not possible to point to any factor as being responsible for the serious damage, more attention to the following factors would have minimized losses :—

(*a*) a more thorough preparation of the soil for the crop ;

(*b*) planting of the crop at a depth not less than four inches ;

(*c*) careful moulding of the crop ;

(*d*) immediate sewing of the bags in the field and the discarding of the practice of placing potato tops on the tops of the bags ;

(*e*) the collection and destruction at frequent intervals of potato tops and the removal of reject, grub-infested potatoes from the farm.

Beech Forest Area.

In the Beech Forest area, the losses due to potato moth activity were negligible, even surface potatoes, which normally are totally attacked, being slightly affected only.

The reasons for this were probably twofold :—

(*a*) The season was such that practically normal conditions, particularly as regards rainfall, occurred during the growing season.

(*b*) The nature of the soil is such that surface cracking does not normally occur, and, in a season where the rainfall is normal and abundant, cannot occur.

Colac Area.

For the purpose of this survey, the Colac area was defined as including the districts of Corrunun, Warrion, Coragulac and Cororooke. In this area, the losses due to potato moth activity were negligble, being confined only to those tubers that were on the surface, and representing a loss of less than 1 per cent. over the whole area. The reasons for this slight damage were probably as follows :—

(*a*) the district is an early one, the potatoes being dug during December and January. In consequence of this, there would be no trouble with a tuber brood of moths such as occurs in other districts in March.

(*b*) Seasonal conditions were such that heavy rains just before and during the digging season prevented the entry of moths to the tubers, by preventing the ground cracking.

(*c*) The preparation of the soil for the crop is very thorough, average to deep planting is practised and careful moulding carried out.

Fig. 12.—A portion of a crop at Millbrook very weedy with black nightshade.

Daylesford Area.

For the purpose of this survey, the Daylesford area was defined as including the districts of Musk, Lyonville, Bullarto, Trentham, Fern Hill and Newham. The losses in this area varied very considerably, chiefly according to the nature of the soil and the incidence of rainfall. For example, on the free and friable soils of the Bullarto, Lyonville and Upper Musk areas no loss of any consequence resulted to either Carmans or Snowflakes, the only tubers affected being those actually exposed on the surface. In each of these three areas careful attention is paid to the preparation of the soil before planting time, initial plowings being deep and subsequent cultivation such as to leave a fine tilth of the soil, which enables the potato digger to be used at digging time. The crops are well moulded as a routine practice, and, if the season is an abnormally dry one, a further moulding is given to protect the top tubers. The crop is dug with a mechanical digger, bagged, the bags sown at once, and the crop removed and stored under shelter.

In the lower lying areas of Musk, losses of up to 20 per cent. of Carmans occurred in light crops in heavier soil where there was a definite tendency for the tubers to be produced near the surface. In the Trentham and Fern Hill districts, losses of from 10 to 20 per cent. of Up-to-dates occurred early, this being due, to a large extent, to the habit of the variety of producing its crop close to the surface. Later varieties suffered little.

In the Newham district, considerably greater losses resulted to early crops, particularly late in March and early in April. Losses of up to 40 per cent. of the crop were common. Late varieties were less severely damaged, heavy rain at Easter time preventing the movement of moths and larvae into the soil. This district had been a very dry one, and, particularly where Up-to-dates had been planted, the soils had opened up and allowed the tubers underground to become infested. Generally speaking heavy mouldings of the crops was the accepted practice. On one farm, however, where no moulding was carried out, very severe damage (60 per cent.) resulted to a crop of Snowflakes, the majority of the tubers being on or very close to the surface.

Summary of Daylesford Area.

Losses throughout the whole area over the whole season were not severe, being chiefly confined to early varieties where losses of up to 20 per cent. were experienced.

These losses were chiefly the result of abnormally dry weather during March. Heavy rains during April prevented further damage.

Cultural practices generally, combined with friable soil, minimized losses in a very dry season.

Emerald Area.

The Emerald area, for the purposes of the survey, included the districts of Emerald and Gembrook. In this area, losses were confined almost entirely to early crops, particularly the variety Up-to-date, where losses of up to 20 per cent. resulted. This was mainly due to a combination of the abnormally dry season early and the habit of this variety of producing its tubers close to the surface. Later varieties were not affected.

Kinglake Area.

In the Kinglake area, where the greatest proportion of the crop is grown by two growers, little damage resulted this season, only tubers exposed on the surface being affected. On one property, the crop was planted rather shallow, 2 to 3 inches, but later deeply hilled, which in reality produced the same effect as a deeper planting. There was on the property, a considerably greater number of tubers than normal produced on the surface, and the majority of these was "grubby". The actual percentage of "grubby" tubers was small, however, as the crop averaged from 10 to 12 tons per acre over 100 acres. On another property, where the cultivation and subsequent moulding were very poor, the soil being very lumpy, still no appreciable grub damage resulted.

These two cases produce an excellent example of the influence of weather conditions on the incidence of potato moth, the rainfall in this district being slightly above normal during the latter portion of the growing season.

Kooweerup Area.

For the purpose of this survey, the Kooweerup area was defined to include Kooweerup proper, Five Mile, Dalmore, Bayles and Catani. The losses in this area can be considered from the point of view of the nature of the soil.

Peaty areas.—In these light soil, peaty areas, no appreciable damage generally resulted last season from potato moth, the majority of the crops being planted at a depth of from 4 to 6 inches on well prepared soil, and then heavily moulded afterwards. The variety Carman No. 2 is most commonly grown as a mid-season to late crop. In several instances, however, where early varieties were grown, losses of up to 20 per cent. occurred and particularly where no moulding of the crop was practised.

Heavy soil areas.—In the heavy soil areas, particularly adjacent to the Kooweerup railway line, losses of from 20 to 25 per cent. of all crops resulted, particularly of the variety Carman. Here, the seasonal conditions were the most important factors as the planting was at a normal depth and good moulding practised. The nature of the soil was such, however, that severe cracking of the surface occurred, combined with a wind effect of blowing about the tops so extensively that a hole was produced in the ground alongside the main stalk which allowed the entry of moths and grubs. It is felt that, in such soil and under such seasonal conditions, losses must occur from potato moth injury.

Neerim Area.

In the Neerim area, no appreciable losses resulted from the activity of the potato moth, except on one property, where roughly 20 per cent. of the early crop was damaged. Generally speaking, the season was a normal one, conditions particularly from January onwards being satisfactory. In this area, reasonably deep planting is practised, followed by heavy moulding of the crop. On the property where the abovementioned damage occurred, it is significant to note that the crop was not moulded.

North-East Area.

For the purpose of this survey, the north-east area embraced the districts of Whitlands, Stanley, Myrtleford and Toombullup. For this area, and particularly in the Stanley district, early crops were severely attacked, an abnormally dry March causing the ground to dry out, together with the production of a large percentage of the crop close to the surface. Later crops were less severely attacked, only about 10 per cent. damage resulting and then chiefly on surface potatoes. It was a significant point, that the deeper planted potatoes were much less severely attacked than the shallower planted crops.

Portland Area.

In the Portland area, where the greater bulk of the potatoes are grown in the Cashmore heath area, no appreciable losses occurred last season, surface potatoes not even being damaged extensively. It is felt that the combination of a sandy soil which runs together well, and abundant rains during the growing season was responsible for this satisfactory position.

Romsey Area.

In the Romsey area, the losses to potato crops due to the potato moth were particularly severe, individual losses amounting up to 75 per cent., with an average for the whole district of approximately 30 to 40 per cent. All varieties were affected, but those potatoes dug before the end of March were less severely damaged than the later ones.

The extremely serious position in this area was caused, it is felt, purely as the result of abnormal seasonal conditions spread out over a period of two years. In the whole of that period and particularly in the season 1937–38, there were no soaking rains sufficient to thoroughly wet the soil, with the result that it was not possible to adequately prepare any measure of fine tilth in the ground. The result was that the potatoes had to be planted in more or less dry soil very lumpy and cloddy. During the growing period, any showers of rain wet the surface only, with the effect that the roots of the plants were brought close to the surface, causing tubers also to be formed close to the surface and preventing efficient moulding operations being carried out.

In addition, the soil, being of a heavy volcanic nature, cracked very badly, and, in such a dry season, this factor would be impossible to overcome. Then again, as at Koo-wee-rup, the movements of the potato tops with the wind, produced at the ground level a further entrance hole through which moths and grubs could enter into the soil and infest developing tubers.

It is felt, therefore, that the severe losses in this district were produced purely as the result of extreme seasonal conditions, and certainly were not the result of any injudicious operations on the part of growers themselves.

It is considered that under circumstances similar to those which operated in this area last season, such losses as occurred are inevitable.

Trafalgar Area.

For the purpose of the survey this area comprised the districts of the Trafalgar Meadows and Narracan. In the former area, the only losses of any consequence occurred where the crops were put in with a planter. Where this was the case, losses up to 10 per cent. of the crop resulted. The reason for this is apparently bound up in the fact that the sets were not put down as deeply into the ground as was the case where they were put in with the plough, with the result that large numbers of tubers were produced close to the surface, in spite of moulding operations later.

In the Narracan district no trouble was experienced with potato moth last season.

Warragul Area.

For the purpose of this survey, the Warragul area was defined as consisting of the districts of Warragul proper, Bunyip, Garfield and Iona. In the Warragul district proper, slight losses of up to 10 per cent. of the crop resulted in early crops, with no appreciable losses in late crops. The losses in the early crops appeared to be caused as the result of rather shallow planting on lumpy soil which did not work down to a fine tilth and allowed the entry of moths and grubs to the higher tubers.

In the Bunyip, Garfield and Iona areas the majority of the early plantings was destroyed by floods, those that remained and were dug early (February), escaped the potato moth. Later plantings were, of necessity, hurriedly put in, and, in the majority of cases, were planted rather too shallow (3 inches), with the result that losses of 25 per cent. were common. Where crops were planted deeper, however, (from 4 inches to 6 inches) and well moulded later, no grub damage resulted.

Warrnambool Area.

For the purpose of this survey, the Warrnambool area was defined as consisting of the districts of Warrnambool proper, Illowa, Koroit and Port Fairy. In this area, it was the unanimous opinion of growers that damage caused by the potato moth last season was the lightest for many years. Only surface potatoes were affected and the damage would not amount to more than 1 per cent. of the total crop. The reason for this is probably that the rainfall during the summer months was well up to average, preventing drying out and cracking of the soil.

Summary.

The Potato Moth (*Phthorimaea operculella* Zell.) caused extensive damage in some of the potato growing districts of the State during the season 1937–38.

The areas most affected were :—

(*a*) The Romsey district, where an average loss of 30 to 40 per cent. of the total crop occurred.

(*b*) The Ballarat district where an average loss of 20–25 per cent. of the total crop resulted.

(*c*) Portions of the Daylesford district where losses of up to 20 per cent. occurred, mostly in early crops.

(*d*) The Emerald district where losses of up to 20 per cent. occurred in early crops.

(*e*) The heavy soil areas of the Kooweerup district where losses of 20 to 25 per cent. of all crops resulted.

(*f*) The North-East district, where losses of up to 20 per cent. occurred in early crops.

Seasonal conditions were such as to definitely favour the incidence of potato moth in the above districts. It is felt that if such conditions occur again, severe losses in some districts are inevitable and are outside the control of the growers.

In the severe potato moth year, just experienced, the following practices proved of value in reducing potato moth infestation to a minimum :—

(*a*) *Preparation of the soil* : the growing of a green crop during the early winter months, ploughing in deeply about August, and planting at the normal time on top of this turned in crop.

(*b*) *Depth of planting* : the planting of the sets at a depth of at least four inches will allow the majority of the tubers formed to be away from the soil surface. While this and greater depths are considered by some growers to have an adverse effect on the yield of the crop, they will certainly produce cleaner crops in such a season.

(*c*) *Moulding* : the throwing of a heavy mould (wherever the soil is suitable) will reduce the possibility of moths and larvae infesting the tubers underground. With the variety Up-to-date which normally produces its tubers close to the surface, such mouldings would have to be carefully carried out, and would need to be wide, shallow mouldings rather than high, narrow ones.

(*d*) *Bagging* : the bagging and sowing of dug potatoes should be done at once, particularly during the months of March and April. The practice of placing potato haulms on top of the sewn or unsewn bags is a bad one. It is much better to sew the bag at once and invert it.

(*e*) *Sanitation* : the burning of potato tops at least once a day is desirable as many grubs and pupae of the potato moth harbour in these tops.

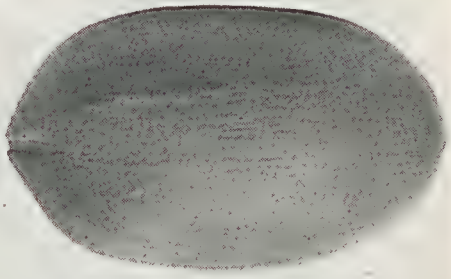
The Pecan Nut

By J. G. Baxter, Orchard Supervisor.

THE Pecan nut, which is a native of the United States of America, is the fruit of one of the species of hickory—*Hickoria pecan*—and is closely related to the walnut. It is found growing in the basin of the lower Mississippi and its tributaries as well as along watercourses in Texas. It is a deciduous, hardwooded tree, the timber of which is used commercially. Despite this relatively small native habitat, it has shown itself capable of adaptation to a wide range of conditions and soils, but as it has not been planted in Victoria as yet, definite recommendations cannot be made.

This nut is grown extensively in the southern States of America, where large areas have been planted with varieties selected for their good quality, productiveness, and disease resistance. Originally, seedlings were planted, but it was found that these varied to such a large extent in the type of nut produced, and the time taken to come into bearing, that this method of establishing plantations was abandoned in favour of budded or grafted trees.

The qualities looked for in good pecan nuts are disease resistance, and early and heavy bearing of full nuts which are soft shelled and of good flavour. The nuts vary from practically globular to elliptical in shape, and are light-brown in colour, often being splashed with purple markings. The shells are usually smooth, although some types are ridged.



The Pecan Nut.
(1½ times natural size.)

Soils.

The soils most suitable are deep, well-drained loams which retain their moisture through the summer. A friable clay subsoil is necessary as the pecan has a very long taproot which must be able to penetrate the subsoil without undue obstruction from impervious clay. Shallow soils with hard pan are totally unsuited for the cultivation of this nut, and any soil in which the water table rises to within 10 feet of the surface is unfavorable. In America, sandy soils have given satisfactory results when overlying a friable clay subsoil, and it is evident that it is the subsoil, more than the top layer, which is the limiting factor in most instances.

Climate.

In America, large plantings have been made in the areas to which the pecan is indigenous, close to the eastern coast. During the growing season, however, the humidity in this area is high owing to the proximity of the Gulf stream, thus favouring the development of fungous diseases to which this nut is susceptible. In the irrigation areas of Texas, Arizona, and California, where the humidity is low, better results are obtained, and it is therefore reasonable to expect that the northern parts of Victoria would be suitable for the cultivation of this nut.

A well-developed pecan orchard in Florida.
[Univ. of Florida, Bull. 191.

Propagation.

Since it was realized that the planting of seedling trees for nut production was

Pecan nuts nearly ready for harvesting.
[Univ. of Florida, Bull. 191.

unsatisfactory, propagation has been carried out by using seedling stocks on to which the desired variety is either grafted or budded. The nuts are sown in early spring 1 inch deep and 6 inches apart in rows. They grow rapidly and are usually 12 to 18 inches high, and ready for working in a little more than one year after planting the seed.

It has been found that shield budding is not satisfactory for the pecan, so the ring or annular bud, and the patch bud, are used during the summer months. If grafting is preferred the whip tongue graft is used when the sap is rising early in the spring. It is important to keep the young trees growing by careful attention to cultivation, fertilization, and, if the weather is dry, irrigation.

Planting Out.

Owing to the length of the tap root, great care must be exercised when lifting the trees from the nursery row, as it is essential that the roots be damaged as little as possible. The tap root usually is about 18 inches long on a one-year-old grafted tree. The roots must not be allowed to dry out after lifting, and if the trees cannot be planted immediately, they should be heeled in until the ground is ready for them.

Before planting, the ground should be ploughed deeply and worked to a fine tilth. The holes for the trees must be deep enough to take the taproot without bending. A useful tool for digging the holes is a post hole auger, as it is not necessary to make the holes very wide.

As the pecan grows up to 100 feet high, and often has a spread of 60 feet or more, it is necessary to plant the trees at least 45 feet apart. Planting closer than this will eventually cause overcrowding and shading, which are not conducive to the production of heavy crops.

Planting should be done early in the winter to give the trees a chance to develop root hairs and heal broken roots before growth starts in the spring. After planting, the trees are headed back, in fact, some writers advise cutting the scion growth back to within three to six buds of the union with the stock. The ground around the trees must be stirred frequently to aerate the soil, and to keep down weeds.

As profitable returns cannot be expected for eight to twelve years, the ground between the rows may be used for small crops such as vegetables or flowers for the market. By using the ground in this way satisfactory returns may be obtained until the trees need the whole area, and are commercially productive. If the soil is of a sandy nature, it is advisable to build up the humus content by sowing cover crops, and ploughing them in.

Stuart.—A large, good-flavoured nut.
[N.S.W. Dept. Agric

Pruning.

Pruning is necessary to shape the tree for the first two or three years, but subsequently it is carried out only to remove any weak or dead wood, or to thin out any dense growth. As the nuts are borne on terminal growths, these must be retained if a maximum crop is expected.

Diseases.

In America, the main disease attacking pecan trees is scab. This affects the wood, foliage, and fruit, and in a favorable season may cause total loss of the crop of susceptible varieties. However, by planting resistant types, the amount of infection may be considerably reduced.

Other diseases such as "rosette," mildew, dieback, and Anthracnose attack the pecan in America, but with our quarantine regulations it should be possible to prevent their entry into Australia. Insect pests may also be excluded by this method.

Harvesting.

The nuts are harvested by collecting those that fall by hand or raking them into heaps. This will represent 10 to 15 per cent. of the crop. The remainder is shaken down after sheets of hessian or canvas have been spread under the trees. The nuts are then freed from husks and leaves, and allowed to dry in an open airy shed before they are marketed.

Prospects.

American experience shows that pecans cannot be expected to bear as heavily as walnuts, but better prices are obtained there for good quality pecans. An estimate of the yield per acre of mature trees is from 1,000 to 1,200 pounds, but pecans are subject to greater seasonal variation than walnuts.

In the Yuma Valley, Arizona, several trees of the Success variety averaged the following crops at the ages stated:—Five years, 15 lb.; seven years, 30 lb.; and fifteen years, 110 lb.

Citrus growers in the north may find that a breakwind of these trees would be a profitable investment. Before planting an area with them, it would be advisable to give two or three trees a trial to see if they grow satisfactorily under local conditions. Good results have been obtained in parts of New South Wales, including the Riverina. At the present time there does not appear to be a large demand for these nuts, but if locally produced they should become popular.

Success.—A popular variety.
[N.S.W. Dept. Agric.

Varieties.

Following is a list of the better known varieties:—

Burkett.—Of medium size, this variety fills well, and is an early and prolific bearer of well flavoured nuts.

Money Maker.—A prolific and early bearer of sweet nuts of medium size.

Pabst.—Large oblong nut of good flavour. Prolific bearer.

Schley.—Large thin-shelled nuts of good flavour. Rapid grower with handsome foliage.

Stuart.—Large good flavoured nut, but has thick shell. Slow to bear, but is prolific. Ripens early.

Success.—Large ovate nut with thin shell and rich, pleasant flavour. Early and prolific bearer.

Van Diemen.—Large, long and smooth nut of high quality. Vigorous tree.

Coast Disease in Sheep and Ataxia in Lambs

Their Practical Control

FOR several years the Council for Scientific and Industrial Research has been investigating the diseases known as Coast Disease in sheep and Ataxia in lambs, which have been responsible for heavy losses in the southern coastal districts of South Australia and Victoria. A report of the investigation, entitled "Studies on Coast Disease of Sheep in South Australia" (C.S.I.R. Bulletin No. 113), was published recently and the following resumé of the report has been prepared by officers of the Council for Scientific and Industrial Research.

Ever since the earliest days of settlement, farmers and pastoralists have used the term Coast Disease to describe a malady which has been observed to develop in sheep continually depastured in certain areas along the coast of South Australia. The common experience is that while the heavy cover of native grasses provides excellent pasturage for the flocks, sheep confined to these areas become lethargic, refuse to eat and develop a wasting disease from which they will die if left there. The disease is known to occur also in Victoria and Western Australia.

General experience has indicated that if sheep showing the symptoms of coast disease are changed to so-called healthy country, they recover their normal health and vigor, although these healthy areas adjacent to the coast are, as a rule, a much poorer class of country. And so alternation of the flocks between the affected and healthy areas has afforded a practical, though not completely effective, means of control of the malady. Where the affected fringe of country is narrow, such measures have sufficed to allow experienced graziers to make full use of the splendid early feed that develops on the unsound country. Where the areas are more extensive, however, the frequent necessity for moving the flocks and the distances involved have rendered unprofitable this means of combating the malady. In the higher rainfall belt, the greater part of the 2,000 odd square miles of seriously affected country has not been developed further but much of it has been allowed to revert to dense scrub which, owing to infestation by rabbits of the abandoned areas, has covered what were previously heavily grassed dunes.

Distribution.

The areas in which sheep become affected with coast disease are well known to the local inhabitants. They consist almost entirely of country where the highly calcareous shell sands have been wind-sorted and thrown up into gently rolling dunes. The calcium carbonate content of the soils is thus extremely high, reaching at times 80 per cent. of the soil. Owing to their origin, these soils sometimes extend scores or even hundreds of feet deep. In some parts, these shell sands have become consolidated into limestone. In other regions, weathering has resulted in an accumulation of the insoluble portion of the original coastal shell sands on the surface. While still unsound, this latter country is not so seriously deficient as that of the relatively much more recent dunes. In other areas still, which are geologically unrelated to the shell sands, similar conditions prevail which limit the well-being of sheep. These areas are as yet not completely mapped.

Symptoms.

After grazing for a period of from four to twelve months, depending on the season and the degree of deficiency of the affected areas, the members of the flock begin to lose their bloom, although previously they may have fattened on the available fodder. Their demeanour changes from vigorous alertness to listlessness; they become weak and lethargic, and so are difficult to move. The eyes become dull and rheumy and a watery exudate mats the wool of the face. Wool growth is seriously affected and the fleece has a "dead" appearance. The affected animals go off their feed and, in consequence, lose weight rapidly.

In sheep grazing on most of the affected areas, anaemia becomes apparent in the blanched

appearance of the mucous membranes of the eyelids, muzzle and mouth. The skin progressively alters during the course of the malady from the normal pink to a pale bloodless colour, and later in the extreme stages of the disease the skin becomes extremely fragile, breaking if the wool is roughly parted. The animals die and on post-mortem examination show, as a rule, few changes which are distinguishable from those of complete starvation. At any stage of the disease, the affected animals may be restored to normal health by appropriate treatment.

Cause of the Disease.

It has been demonstrated by investigators in the Nutrition Laboratory of the Division of Animal Health and Nutrition, that coast disease is the result of a deficiency of two minor elements, cobalt and copper, in the fodder, and it is apparent that the pastures which grow on affected country cannot supply sufficient of these substances to fulfil the normal requirements of sheep.

Very minute amounts are necessary, however, and it has been demonstrated that one milligramme of cobalt (about one-thirty-thousandth of an ounce) each day more than fulfils the requirement of the sheep for this element. About five times this amount of copper, conveniently administered as the salt copper sulphate (blue stone), fulfils the copper requirements of sheep while grazing on country very seriously deficient in copper. Sheep, however, are seemingly unable to store sufficient cobalt to provide the normal requirement over lengthy periods. This also applies to copper but to a less extent and so it becomes imperative, if these elements are to be given as a drench or in the food or as a lick, *to administer the copper and cobalt frequently.*

Practical Control.

The experimental investigations so far completed have amply demonstrated that sheep may be kept in good health while grazing continuously on deficient country if they are given by mouth

Showing the effect of cobalt plus copper treatment on sheep suffering from coast disease. Left.—The last surviving member of a group treated with iron plus copper. Right.—A sheep typical of a group, all of which survived, treated with cobalt plus copper. Both the above sheep were in a similar condition when treatment began.

[C.S.I.R.

the equivalent of 1 milligramme of cobalt and 5 milligrammes of copper per day in the form of soluble salts. Untreated control animals which were run together with those receiving the cobalt and copper all died of coast disease during the first year of continual grazing on the affected country.

In the experiments it was essential that all animals received the material regularly, and to ensure this the salts were dissolved and administered as a drench three times weekly. However, during the last two years, it has been determined experimentally that the elements may be administered with equal success when incorporated in a salt lick.

Both copper sulphate and cobalt chloride, the salts usually employed, are poisonous if consumed in too great amount, and so *in the practical control of the disease the intake of these materials must be carefully regulated.* If drenching is employed this is achieved simply enough, but if control of the deficiency by salt licks is to be used, care must be taken to ensure that the intake does not deviate appreciably from the amounts prescribed above. Where sheep are familiar with saltlicks and consume them regularly, the administering of the elements through this source is simple. The amount of salt lick taken by sheep in practically all areas varies within wide limits with the season, more being consumed, as a rule, when the fodder is dry. It thus becomes imperative to estimate from time to time the amount of lick taken by the flocks and to alter accordingly the concentration of the active principles in the lick so as to ensure not only that the desired amount is consumed, but also that the small quantities necessary are not materially exceeded.

A simple way to achieve this end is to procure an intimate mixture of finely pulverised cobalt chloride and copper sulphate in the proportion of one part of cobalt chloride to five parts of copper sulphate. The ratio of cobalt to copper in this mixture is sufficiently close to 1 : 5 for the purpose. Six ounces of this mixture will be sufficient for 1,000 sheep for a week. The cost is very small.

To avoid the necessity for weighing small quantities, it is convenient to dissolve six ounces of the mixture in a gallon of water, using an earthenware pot or an enamelled bucket for the purpose; *galvanised iron utensils must on no account be used.* An ideal means is to employ ½-gallon flagons, which are usually easily obtainable, and dissolve 3 oz. of the mixture in each. One pint of this stock solution then is sufficient for 125 sheep per week. This stock solution diluted by the addition of two parts of water may be used as a drench if occasion arises, ten cubic centimetres being administered once each week.

When administered incorporated in a salt lick, the intake of salt is estimated by placing a measured excessive amount of common salt out in covered troughs, and weighing the unconsumed portion after a period of a week. The difference i.e. the loss of weight, will give the consumption by the flock per week. The amount of the mixture necessary is then calculated and incorporated with the salt, on the assumption that the intake of the salt will continue at this determined level for the ensuing week or so.

The procedure might best be made clear by an example. Assume that 100 lb. of salt is put out in covered troughs to which 1,000 sheep have access for a week. After this period, 20 lb. remains, therefore 1,000 sheep have consumed 80 lb. in this period, and the average weekly intake per head is thus 1·28 oz. Eight pints of the stock solution (1 pint being sufficient for 125 sheep per week) thoroughly mixed with 80 lb. of salt will then provide the required lick for 1,000 sheep per week. This procedure is really very simple.

Intake of lick should be frequently estimated by the person in charge of the flocks who will soon become expert at determining the rate of consumption and at compounding the supply so as to be sure that the animals all receive their requirements of the active material. If reasonable care is exercised, there should be no fear of administering too little or too much of these elements to the sheep.

Naturally, some modifications in procedure must be made in areas where the flocks do not readily take salt licks. In such cases, licks should be rendered attractive to the flocks by incorporating materials such as molasses, linseed, grain, bran, &c., which are sought after by the sheep.

If some individuals in the flock do not take the lick, they will soon develop obvious symptoms. The tail of the flock should then be drafted off and drenched with the diluted stock mixture until they learn to consume the licks. The dramatic response of affected animals to the above treatment will very soon convince the pastoralists on coasty country of the value of the treatment and amply compensate them for the very small amount of trouble involved.

Ataxia in Lambs.

Ataxia in lambs occurs in areas where coast disease is common but is more common on transitional country where the severity of the cobalt

and copper deficiencies is not so great and where in consequence, some degree of success may be obtained in breeding sheep. It also occurs in other areas where cobalt deficiency is not evident. It was found first by workers in Western Australia, and later in South Australia and Victoria to be associated with copper deficiency and can be prevented by supplying copper in small amounts to the breeding ewes.

It is characterised by the development of an unsteady gait by the lamb soon after birth and rarely as late as two to three months of age. Symptoms are usually progressive; the lamb, completely losing power in the hind quarters, becomes paralysed, is unable to feed and dies.

In those areas near the coast where the disease becomes manifest, the use of the copper and cobalt drench or lick will prevent its occurrence. In those districts remote from the coast where the disease develops in the absence of coast disease, the inclusion of cobalt in the drench or lick may not be necessary although more evidence is required before it can be claimed definitely to be unnecessary or undesirable.

Summary.

To make the stock solution take :—

½ oz. finely powdered cobalt chloride
2½ oz. „ „ copper sulphate
Add to ½ gallon of water.

Thoroughly mix until the salts are completely dissolved.

Alternatively the salts can be obtained in the finely ground condition already mixed in the proportion of 1 : 5, and 3 oz. of the mixture used in ½ gallon of water.

For drenching take one part of the stock solution and add to two parts of water *Dose.*—10 cc. once a week.

When preparing the lick (*a*) Determine consumption of common salt per week of a group of sheep; (*b*) If x = number of sheep, add $\frac{x}{125}$ pints of the stock solution to the amount of salt consumed by that number of sheep in a week, or any multiple of these proportions if more than one week's supply is to be made at a time.

Vaginitis in Cows

By A. R. Grayson, B.V.Sc., Veterinary Officer.

CONTAGIOUS Granular Vaginitis of the cow is a condition which is relatively common in Victoria. It is characterized by a slight glairy vaginal discharge with often frequent attempts at micturition and erection of the clitoris. There is also present nymphomania and frequent returning to the bull. On examination the mucous membrane of the vagina shows patches of congestion, often in the form of stripes verging to the clitoris. Small nodules or granules can be felt in the mucosa, especially along the congested stripes. It should always be remembered that vaginitis with its consequent sterility can be, and often is, spread by the hands of the examining person.

In the bull the penis may show a similar condition. In neither cows nor bulls is there any marked systemic disturbance.

For treatment the external genitals should be regularly irrigated with a mild astringent antiseptic solution such as sulpho-carbolate of zinc, 1 in 500. The insertion of similar antiseptic pessaries may be of use. Perseverance with the treatment is necessary. Cows, while affected, should not be mated with the bull. Careful examination should be made of any newly purchased cow before admission to the herd, and thorough disinfection, including sheath, penis, nose, and chest of the bull, should be practised after service of any strange cow.

Dehorning of Cattle

By W. M. Lerew G.M.V.C., Veterinary Officer.

DEHORNING of cattle is a subject that during recent years has been attracting a steadily increasing amount of attention throughout all the principal cattle-raising countries of the world, not only from the point of view of the grazier and dairyman, but also from that of the large beef exporting firms. It is rather remarkable that it has not become a general practice throughout the world, as it has everything in its favour and, if properly carried out, nothing against it. It is well recognized that horns can be bred off cattle by using polled bulls, and in the case of beef cattle, breeders have the choice of four different breeds of hornless bulls, namely, Red Poll, Aberdeen Angus (Black Poll), Polled Hereford, and Polled Shorthorn. Using either of the first two naturally hornless bulls will give an extremely large proportion of hornless stock, and the few calves that are not entirely hornless will probably grow short stubs of horns which are generally loose instead of being firmly attached to the bony structure of the skull. These can be easily removed. In the case of Herefords and Shorthorns, pure-bred hornless specimens of each breed have been imported into Australia from America, and have been exhibited at Melbourne and Sydney shows, where they created a very favorable impression. These bulls, when mated with horned cows, have left over 70 per cent. of absolutely hornless stock in the first generation, illustrating the possibility of breeding the horns off Australian beef cattle.

The breeding of these pure-bred polled bulls has been achieved by careful selection, using hornless "sports" as a foundation to establish the strain, and as hornlessness is a dominant factor when attained in cattle the eventual hornless condition was arrived at in a reasonably short period. This may be proved by noting the number of generations through which the polled condition appears again, even when bred back with only horned cattle. To breed the horns off all cattle in this way would be ideal, but, owing to the small number of suitable bulls available at present, other methods have to be adopted. Among the recognized breeds of dairy cattle there is unfortunately only one hornless species, the Red Poll. This means that, in order to retain the valuable characteristics of the various breeds, and to avoid cross breeding, it will be necessary to remove the horns.

There are two different ways of removing horns; first, to stop the growth of horn in the young calf, and the second, to remove the horns from the full-grown beast. The first method, which prevents the horn from developing, is carried out on very young calves by

A dehorning bail with head clamp closed, showing side gate.

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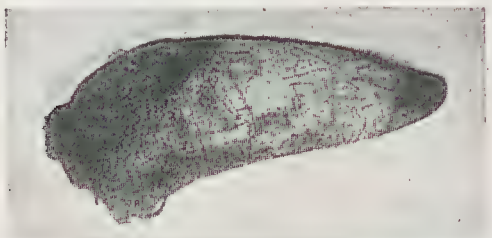

Showing horn after correct cutting. Note hair and skin attached.

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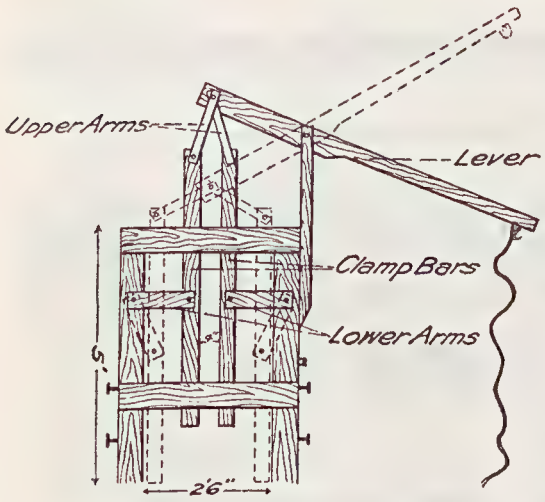

The front view of a dehorning bail.
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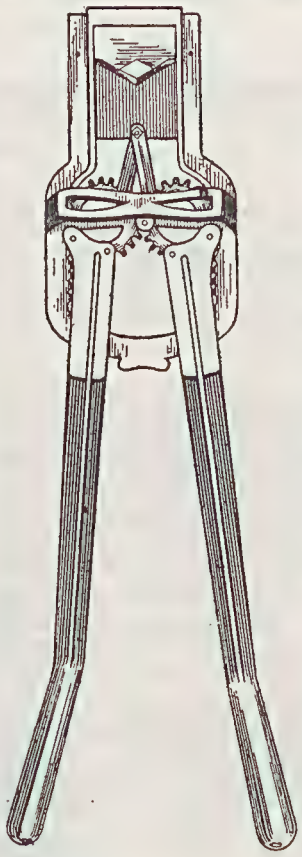
means of the application of some caustic substance to the immature horn bud. The procedure is very simple and is carried out in the following manner. The calf should be treated when between the age of two and seven days, the hair being clipped off around the horn bud and a coating of vaseline applied to the surrounding skin to prevent injury from the caustic. Caustic potash, which is the preparation generally used, may be obtained in the form of rods or pencils from any chemist, and should be wrapped round with tough paper to protect the operator's fingers. The horn bud should be lightly rubbed with a piece of fine sandpaper till the surface becomes moist but not bleeding. Then rub the horn with the caustic, taking care that the whole surface has been treated. This should be repeated two or three times at intervals of a few minutes till blood appears in the centre of the horn. If done thoroughly the growth of horn will be prevented and the animal will suffer hardly any inconvenience. After applying the caustic take care that the calf is not exposed to rain for a day or two, as the caustic may run down the face and injure the skin. After using the caustic stick wipe any moisture off it and keep it in a well-corked, wide-mouthed bottle. Otherwise it will absorb moisture from the air and melt away. In cases of burning of the skin by caustic potash, immediately apply a weak solution of vinegar and water to the injured part.

The other method of dehorning entails the removal of the fully developed horns, and is preferably carried out when the animal is about two years old, but may be done at any later age. The instruments generally used are either a sharp tenon saw or a cattle dehorner. The most convenient method of handling is to put the beast in a crush with a strong solid bail at the end, in which the head may be securely held. A pair of nose grips (bull holder) inserted into the nostrils and held by an assistant is a great help in keeping the head steady while the horns are being removed. A few quick strokes of the saw at the base of the horn is all that is required to remove it.

Cattle Dehorners.

There are two types of cattle dehorners in common use, the first of which somewhat resembles a pair of secateurs with two concave blades. On closing the handles the blades, which overlap each other, are forced together through an ingenious arrangement of levers and rollers, and the horn is severed cleanly. The second type of dehorner is constructed on the principle of the guillotine, and the blades, one of which is fixed, are in a frame. This is pushed down over the horn, and the necessary purchase is obtained by closing the handles, which operates a rack and pinion gear. The blades overlap when closed and the horn comes off quite evenly. After removal of the horns apply a dressing of dry antiseptic cotton wool. This will stop bleeding and keep out any infection. In a little while the skin will grow over the base of the horn, often without leaving any trace of the operation.



Dehorning clippers.
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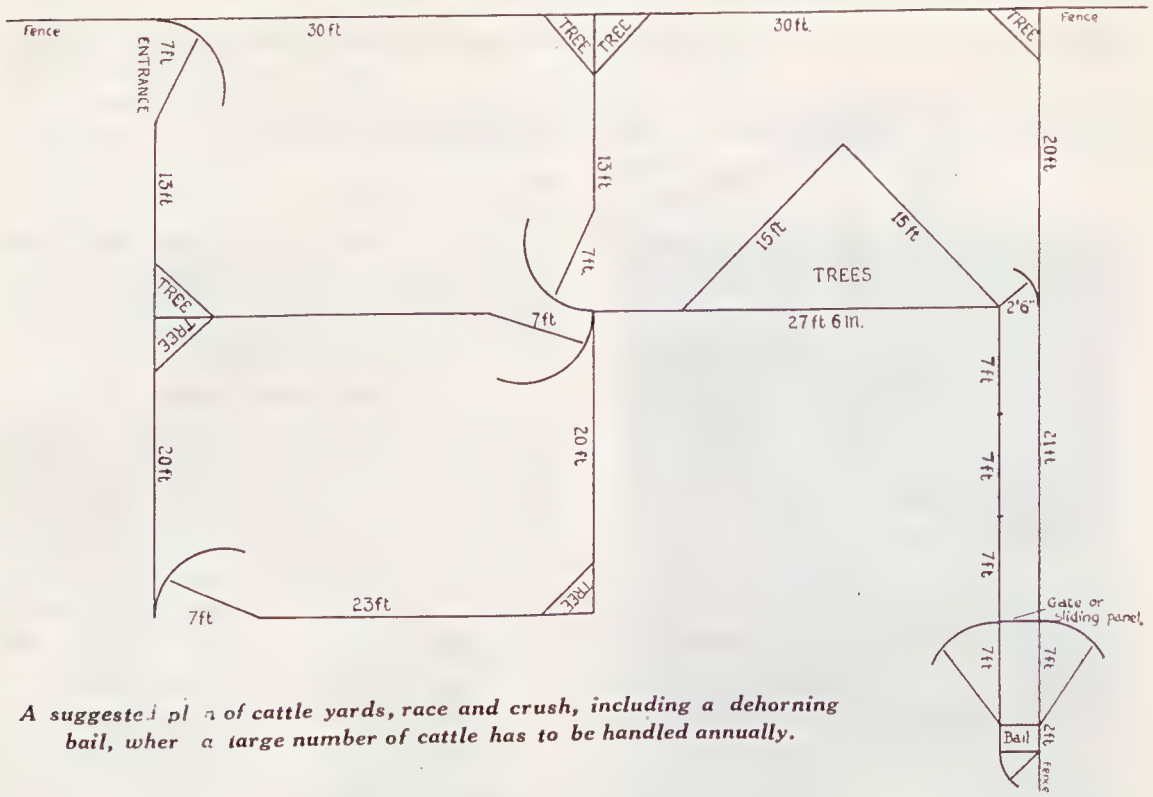
When using the dehorner care must



A suggested plan of cattle yards, race and crush, including a dehorning bail, where a large number of cattle has to be handled annually.

Details are as follows :—Posts 10 ft. 6 in., sunk 3 ft. 6 in. in ground. To be strutted at gateways and corners. Rails 4 in. (or 6 in.) x 1½ in. hardwood. Removable rail in each gate at suitable height for handling animal. Double bail tongues adjustable for size of neck. Sharp edges of rails on crush gates to be planed. Front end gate of crush to be close boarded, all rails to be bolted on inside of posts and countersunk. Posts in race 7 ft. apart. All fences 7 ft. high with cap rail. Cap rails across race and crush to prevent spreading. Heavy bolts on all gates both top and bottom of crush. Centre yard gates to swing either way. Gates 6 ft. high, cap rail over gateway. Five rails in each gate (1 ft. apart for 4-in. rails). Five rails and cap in fences (1 ft. apart).

be exercised to ensure that an even pressure is maintained, as any uneven or jerky movement may cause the horn core to be pulled away from its attachment to the skull, leaving a large cavity which is difficult to keep clean and heal over. The dehorner should be thoroughly sterilized before using, and should also be dipped in some antiseptic solution after each horn is removed. The operation should be carried out in either the late autumn or early spring, when flies are not troublesome and mild weather prevails.

The principal advantages of dehorning may be briefly summarized as follows:—Removal of a source of danger to human beings and also to other animals. This means that skin wounds and torn udders would be reduced to a minimum. Nervous, timid cows can feed in safety. Smaller yards to hold the milking cows, as they will stand quietly and not interfere with each other. They also thrive better, as they do not disturb each other when feeding. Bullocks especially benefit, when being trucked long distances, as they cannot injure each other when in transit.

The only objection to removing the fully grown horns is the transient pain suffered during the few moments of the operation. If this small amount of pain is compared with the damage and suffering inflicted by a pair of horns during a beast's lifetime, every animal lover should at once become an ardent supporter of compulsory dehorning of all cattle.

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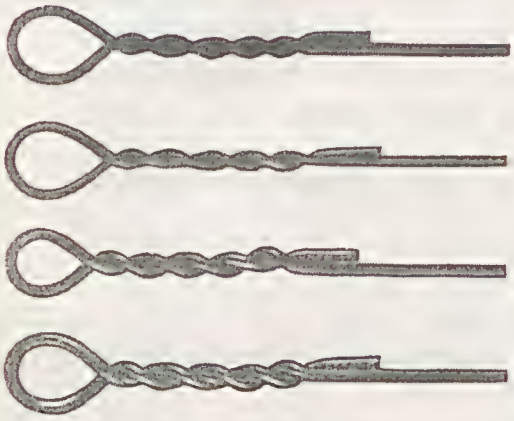

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Bacon-Curing on the Farm

By J. C. Marshall, late Senior Stock Inspector

THE best time to kill pigs intended for bacon is during the winter; in the absence of some system of refrigeration it is risky to do so at any other season. If for any reason slaughtering is necessary during warm weather, advantage should always be taken of a cool change.

Type of Pig.—Carcasses that yield the best bacon are not usually those of heavy animals, though of course good bacon can be obtained from such. The bacon most sought after in this State is that from pigs of a dressed weight between 100 and 130 lb. If nice "streaky" bacon is to be had, it is essential that the pig should be well fleshed and in a "finished" condition at the time of slaughter.

Killing.—For from twelve to 24 hours before killing, pigs should be rested and not allowed any food, but should have access to plenty of clean, cool water.

There are several methods of killing. Probably it is best to stun the animal first, then "stick" him in the throat by inserting a sharp, pointed butcher's knife immediately in front of the breast bone towards the heart. If this be done well the pig will bleed thoroughly, and a "good bleed" is desirable for bacon of attractive appearance.

Scalding.—Immediately the pig has stopped kicking the carcass should be immersed in water of a temperature from 165° to 170° F. Water of about this temperature can be obtained by mixing two buckets of boiling water and one of cold. In very cold weather it may be necessary to add a little more boiling water to make sure that the temperature will not fall below 165°.

A big tub, an old bath, or a wooden vat makes a suitable scalding receptacle, and it should be from half to three-quarters full. The carcass must be moved about in the bath and vigorously scraped, particularly the head and feet.

When most of the hair has been removed the carcass should be hung up by the hind legs, washed with clean, cold water and any remaining hair scraped away, or if necessary shaved off with a sharp knife. It should, while hanging, be disembowelled and cleaned. At this stage it is advisable to run the knife down each side of the back-bone and cut away all loose fat, including that around the kidneys and the "flair" fat.

If a pig be killed in the evening the carcass should have properly cooled and set firmly by next morning, when it may be cut up into sides and hams, or if preferred, into hams, middles and shoulders.

Curing.—The farmer must choose one of three methods:—(1) Brine curing; (2) Dry salting; or (3) A modification of both 1 and 2.

The cooler the curing-room is kept the better; its temperature should never rise above 70° F. It should be kept as dark as possible; a cellar is an excellent place.

Brine Curing.—For the making of brine the ingredients required are:—Salt, salt-petre, and brown sugar, and it should be ready as soon as the carcass is cut up. To every petrol or kerosene tin of clean, cooled, boiled rain-water add 10 lb. of coarse salt and 2 oz. salt-petre. In this brine an egg or a potato should float and it should be kept at this strength throughout the curing process.

The pork pieces should be rubbed well with dry salt and left to drain for about two hours. They should then be placed in the brine and weighted down so that they will be well covered with it. They should be frequently taken out of the liquid—at the very least once a week—and rubbed with dry salt, especially around the bone sockets and the knuckles. A test should be made of the brine every now and again to make sure that it is up to strength. The vat must be kept covered so as to prevent any light reaching the bacon, for light may affect the colour of the finished product. A good cure should be effected in about three weeks and the bacon may then be scrubbed in warm water to which a little baking soda has been added.

Dry Salting.—The method just described is known as wet salting. Dry salting consists of rubbing the pieces often and regularly with a mixture of salt, saltpetre and brown sugar in the same proportions as used for making brine. A slate slab on a bench makes an excellent dry salting place. Any liquid formed by the meat juices during the process should be poured back over the bacon.

At the end of three weeks, the bacon should be well-cured, and it should then be treated in the manner suggested for that cured with brine.

Modified Process.—Brine is injected into the pork pieces in several places before they are rolled with the curing mixture on the bench. For this method, a brine pump is necessary so that the pickle may be well injected into the pieces. If a pump can be obtained, it would be well to inject brine even into the pieces that are to be dry salted, for it makes curing a safer proposition especially if the weather is any way warm.

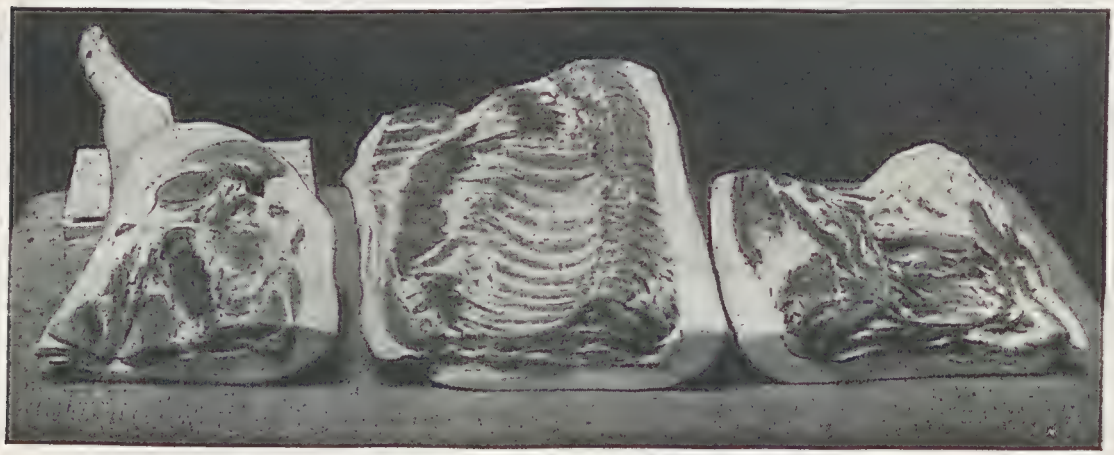
After the brine has been injected the bacon should be thoroughly rubbed every two or three days for three weeks, when it should be scrubbed in clean water as is done with brine-cured and dry-salted bacon.

Where brine is used, the addition of a quart of sweet, previously used, mature pickle will help to produce a bacon of a better colour than that cured in new brine.

If hams are to be kept for lengthy periods, they should be left a week or so longer in the brine; or if more convenient, they may be rolled daily with the salt mixture for some time before being placed in brine.

Smoking.—Hang up the bacon and hams and when all weeping has stopped, they are ready for smoking. Slow cool smoking is the best; over-heating will make the fat melt and spoil the appearance of the finished article.

Where a carcass has been cut into shoulders, middles and hams, the smoking can be carried out in a large barrel, or an iron drum, or an old iron tank. Make a clean small fire and cover



A side cut up ready for curing.

[Continued on page 39

Cutworms

By

R. T. M. Pescott, M.Agr.Sc., F.R.E.S., Entomologist, and T. W. Hogan, B.Agr.Sc., Asst. Entomologist.

An adult cutworm moth (Heliothis obsoleta Fabr.). (Enlarged.)

IN certain seasons, cutworms are responsible in Victoria for severe losses to summer fodder crops, to cereal crops, to market garden crops, and, in some cases, to fruit crops. They are pests of world-wide importance, and derive their name from their method of feeding on the stems and foliage of plants, cutting the stems off at or above ground level, with the resultant destruction of the attacked plant.

In Victoria, three species of cutworms commonly occur, the two "climbing cutworms" or "army worms", *Persectania ewingi Wwd.* and *Cirphis unipuncta Haw.* being most commonly found attacking grasslands and cereal and other crops, while the cutworm known in America as the Corn Ear Worm, *Heliothis obsoleta Fabr.* attacks such crops as maize, potatoes, tomatoes, tobacco and the like. It is known popularly here by various names such as the tomato worm, the tobacco budworm, and the maize grub.

Practically all economic plants are subject to attack, the chief being cereal crops, flax, maize, pastures, tobacco, tomatoes, potatoes, onions, market garden crops, flowers, fruit trees and young nursery stock.

Typical cutworm larvae. (Enlarged). During the day they may be found coiled up in the soil, as shown in the lower illustration.

Life History.

Cutworm caterpillars are the larvae of night flying moths, which usually are found flying early in spring. These moths lay their eggs chiefly on moist soil under weeds and grasses, but, in some cases, on the foliage itself. After a short incubation period, these eggs hatch into small cutworms which feed, at first, on the young growths of any plants present. They shelter in the soil, just under the surface of the ground, during the day, coming up to feed at night. After four to six weeks of feeding, during which time they moult or shed their skins some five or six times as they increase in size, they become fully grown, and are then about 1 inch to $1\frac{1}{2}$ inches in length, greyish to greyish green or brown in colour, and generally possessing a "greasy" appearance. As many as 100 of these larvae have been found under a single potato plant or a young fruit tree in the nursery. When fully grown, these cutworms pupate in the soil, later emerging as the adult moths, and the life cycle is then repeated. There are usually two broods in one season.

Control.

Of primary importance in the control of cutworms attacking any of the previously mentioned

Showing cutworm damage in an onion crop at Colac, November, 1938.

crops is the elimination of weed plants under which the spring eggs are deposited. Careful attention to this factor will, in a great measure, minimize future losses.

Poison Baits.

The generally accepted method of controlling cutworms is the use of poison baits. These are prepared from the following formula :—

Bran	24 lb.
Paris Green	1 lb.
Water	3 gallons.
Salt	8 oz.

It was shown first in New South Wales, and it has been our experience in Victoria, that the addition of half a dozen crushed lemons to the above formula increases its effectiveness.

The bran and Paris green should be thoroughly mixed together in a dry state, and then the water in which the salt and crushed lemon have been dissolved, slowly added until a damp (not sloppy) mash is formed. If Paris green is not obtainable then arsenite of soda can be substituted, using 12 oz. of arsenite of soda for every 1 lb. of Paris green in the original formula. It should be pointed out that this bait, however, is not as effective as the one containing Paris green and should be used only when Paris green is not obtainable.

The bait should be scattered over the ground in the late afternoon so as to be fresh and attractive to the cutworms when they emerge from the soil to feed in the early evening. It should be broadcast uniformly over an affected area in the case of a young crop, or spread along the rows of an affected crop, e.g., potatoes, tomatoes, or onions. As a rough guide, about 100 lb. of prepared bait (containing roughly 45 lb. of dry bran) per acre is necessary for a single treatment. In cases where an infestation is abnormally severe, however, it may be necessary to considerably increase this quantity of bait per acre, or even to bait an acre several times to obtain a satisfactory control.

It should be remembered that this bait is poisonous, and should be handled by responsible persons only, and kept away from all animals.

Control in Tobacco.—Cutworm control in tobacco in Victoria is now considered as part of the routine in growing this crop. The method used is to

A potato crop in the Colac district which has been damaged by cutworms. Nov., 1938.

dust the plants immediately after transplanting and at fortnightly intervals until "topping time" with a mixture of 1 lb. of arsenate of lead powder and 15 lb. of pollard or a mixture of 1 lb. of Paris green and 35 lb. of pollard, by means of a finely perforated tin can which is roughly shaken on each plant in turn.

Control in Tomatoes.—With tomato crops, the young plants at transplanting time should be dipped in an arsenate of lead solution, 1 oz. of paste to 1 gallon of water before planting. After planting, the plants should be regularly sprayed with arsenate of lead, 1 lb. of paste to 16 gallons of water or dusted with a 50 per cent. arsenate of lead dust, or, if a severe outbreak of cutworm occurs, poison bran baits should be broadcast over the affected area.

Onion plants damaged by cutworms. Note the nipped-off tips.

Control in Maize.—The treatment of cutworms in well established crops of maize is considered both impracticable and unsound, but where a young crop of maize is being attacked by cutworms migrating from neighbouring paddocks considerable success can be obtained by the use of poison bran baits. (See control in crops—migration of cutworms.)

Control in Pastures, Crops, &c.—Where cutworms are attacking pastures or crops fairly generally, and the value of the crop is such that it warrants extensive control measures, poison bran baits should be used as described above. Quite frequently, however, cutworms migrate from an uncultivated to a cultivated area, or from one cultivated area to another, and in such instances the spreading of the bait in front of the moving cutworms (as with grasshoppers) will frequently check the outbreak.

Ploughing a furrow a short distance in front of a line of migrating cutworms, with the steep side of the furrow facing the cutworms, is another method that may be used. When cutworms are concentrated in this ploughed furrow, they may be destroyed mechanically or poison bran bait thrown to them.

Control in Lucerne.—When lucerne crops become abnormally affected with cutworms, it is usually advisable to cut the crop as soon as possible so as to obtain some produce, at the same time destroying a large number of cutworms present, thereby increasing the chances of the succeeding crop being clean. Chemical methods of treatment are usually not practicable in such a crop.

Control in Fruit Trees.—Where cutworms are commencing to attack the young fruit on apple and pear trees, increasing the normal arsenate of lead codling moth sprays from 5 lb. of paste in 80 gallons of water to 8 lb. of paste in 80 gallons of water will usually prove satisfactory.

Bacon Curing on the Farm

(Continued from page 36).

lightly with pine saw-dust and place the barrel from which the bottom has been removed over the smouldering smoke. The top of the barrel should be removable and the pieces hung over the smoke at least a foot above the embers. The process should be extended over a few days until the desired colour has been obtained. Smoking, as well as adding a flavour to the bacon, has a preservative effect.

If it is proposed to keep the bacon for any length of time, it should be put into muslin or hessian bags and stored in a cool dry well-ventilated place. Damp may cause mould. If this be noticed, the bacon should be wiped clean and dressed with a mixture of olive oil and formalin—30 parts oil to 1 of formalin. A couple of applications will remove the mould and improve the appearance of the bacon.

Chick Sexing

Results of Examinations

By H. F. Clinton, Poultry Expert.

EXAMINATIONS in chick sexing were conducted by the Department of Agriculture, at the Burnley School of Primary Agriculture and Horticulture, during October last. In order to provide an opportunity for persons who wish to qualify for a Special or a First Class Government Certificate it is the intention of the Department to hold these examinations annually.

For very many years attempts have been made to determine the sex of the future chicken in the egg, either by a mechanical indicator, by the shape of the egg, or in some other way. From the result of experience it appears that no reliability can be placed on any of these methods up to the present time.

Investigators have also concentrated on an endeavour to find a practical method of distinguishing the sex of chickens at the time of hatching. A high degree of success in this direction has been achieved by a method discovered and developed by the Japanese. This method, which depends upon the examination of the cloaca, is largely practised in many parts of the world at the present time, and it was the method used by the candidates at the chick sexing examinations conducted by the Department of Agriculture. Another method which has received attention is that known as sex-linkage, a term which implies the possibility of distinguishing the sexes of day-old chicks, which are the result of the first crossing of two pure breeds, by their colour and in other ways.

Many poultry farmers prefer to have the sexes separated at the time of hatching, as the cockerels can then be disposed of immediately, or kept by themselves, to be sold later for table purposes, and the pullets reared separately for the more profitable branch of egg production under ideal conditions necessary for their proper development.

Sex Linkage.

If a Rhode Island Red male is mated to a Light Sussex female, the sex of the chickens so bred can be determined immediately after hatching. The male chicks will be white or yellow, and the females a warm buff or brown. Quite a number of crosses may be made with different breeds.

In one true-breeding race of fowls the "Cambars," there is no need to cross for the production of a sex-linked result. The Cambar is a light breed developed by Professor Punnett of Cambridge University who, with Professor Bateson, was first in the field regarding the discovery of sex-linkage in poultry. In appearance the Cambar much resembles a Campine, and is, in fact, descended from gold Campines crossed with barred Rocks. The main point in connexion with the Cambar is that it possesses the quality

Sex Linkage.

Lower left; Female chickens following the color of the male parent (Rhode Island Red) and lower right, male chickens following the color of the female parent (Light Sussex). The two top birds are the parents and the two centre ones are the grown chickens.

of sex-linkage within itself, no further crossing being necessary. Thus the male day-olds are of a pale grey shade striped with brown, while the females are much darker in their brown colouring and show only a few streaks of white or grey here and there. The Cambar was exhibited for the first time at the World's Poultry Congress at the Crystal Palace, in 1930. An endeavour is being made to work this breed up for egg production.

The White Leghorn, however, could not be used for sex-linkage purposes except, perhaps, when crossed with some heavy breed—one a quick feathering and the other a slow feathering breed—and the sex of the chicks identified by the length or quickness of growth of the wing feathers, for fast and slow feathering, it is claimed, is sex-linked. It has been stated, also, that it may be possible to establish two strains of White Leghorns, using the principle of quick and slow wing feathering as a basis, and the sex of the chickens distinguished at a day old. The sex of White Leghorns cannot be unfailingly determined by any casual observation until the birds are about four to six weeks old.

The Japanese Method.

While there has been no difficulty at all in sexing day-old ducklings by means of the presence or absence of the male copulatory organ, it had not been found possible with chickens until a method of sexing day-old chicks by the presence, size, appearance or absence of a rudimentary organ on the ventral rim of the cloaca was discovered in Japan by Messrs. Masui, Hashimoto, and Ohno, in 1925, and at the World's Poultry Congress, held at Ottawa, Canada, 27th July to 4th August, 1927, a paper was presented by Professor Dr. Kiyoshi Masui, Tokyo Imperial University, Japan, entitled "The Rudimental Copulatory Organ of the Male Domestic Fowl with Reference to the Difference of the Sexes in Chickens."

As may be imagined, this method of sexing is a very delicate and skilled operation, requiring keen eyesight and a suppleness and delicacy of touch that are not found in every individual. The details of the process take a long while to learn, and considerable practice is required before a high rate of speed and efficiency can be reached. Certain practical poultrymen and investigators, like Messrs. Kojima and Sakakiyama in Japan, through concentrated study and practical application have contributed towards bringing the discovery of the scientists out of the laboratory into the practical field of the hatchery and poultry farm. After several years of educational work in Japan, where chick sexing has become firmly established, a large number of first class experts have been developed. The Japan Chick Sexing Association has sent a great number of experts to Canada, the United States of America, England, France, Belgium, and Australia. These experts have demonstrated and taught the method, and done actual work on a commercial scale at many poultry farms and hatcheries.

Examination Results.

Particulars governing the chick sexing examinations, held at the Burnley School of Primary Agriculture and Horticulture on 11th, 14th and 18th October, 1938, are as follows:—

Candidates for a Special Certificate were required to sex 300 White Leghorn chickens in 45 minutes, with an accuracy of 98 per cent. without killing or injuring a chicken. Those sitting for a First Class Certificate were required to sex 200 White Leghorn chickens in 30 minutes, with an accuracy of 95 per cent., without killing or injuring a chicken.

Eleven candidates presented themselves for examination—seven for a Special Certificate, and four for a First Class Certificate.

No Special Certificates were awarded, but of the total number of eleven candidates, four who sat for a Special Certificate, received a First Class Certificate for the first 200 chickens sexed. The successful candidates were as follows:—

	Accuracy.
Mr. E. J. Marchant, Park-road, Baulkham Hills, New South Wales	98·0 per cent.
Mr. T. H. Pettigrove, 159 Hawdon-street, Heidelberg, N.22 ..	97·5 per cent.
Mr. W. J. Millington, "Fenton," Murray-road, Fawkner, N.15 ..	96·5 per cent.
Mr. H. A. Jenkin, Bailey-street, Belmont, Geelong	96·0 per cent.

Fertilizers Act

Registrations and Unit Values for 1939

By W. C. Robertson, Chemist

THE provisions of the Fertilizers Act require every manufacturer or importer of fertilizers, who desires to have a brand registered in respect of any fertilizer, to make application in writing to the Director of Agriculture for the registration of such brand. The application must be made on or before the first day of November in each year or before selling, or attempting to sell, the fertilizer.

The Act defines a fertilizer as any substance containing nitrogen, phosphoric acid or potash manufactured, produced or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants, but does not include farmyard or stable manure or any crude offal or other unmanufactured refuse. All bags or parcels which contain fertilizer must be branded with the registered brand, and have a label attached giving a statement of the analysis clearly certifying the fertilizing constituents, and also the net weight in pounds contained in the parcel. The Act does not apply to any sale where the quantity of fertilizer sold is less than 56 lb.

The main list of brands registered for the current year, which appears as a supplement to this issue, contains the brand names for 145 artificial fertilizers, an increase of 11½ per cent. compared with the main list for the previous year.

Because a brand is registered it must not be assumed that it is recommended by the Department of Agriculture. All applications for registration are accompanied by (1) a guarantee as to composition (a copy of which appears on the label affixed to the bag or parcel containing the fertilizer), (2) a statement as to the raw material from which the fertilizer is manufactured or prepared, and (3) the retail price per ton. Providing the latter is within reasonable limits of the value calculated by the unit value system the registration is accepted irrespective of its agricultural value.

A brief survey of the brands registered (see supplement) will show that the majority consist of, or are mixtures of, a few common fertilizers which are in use all the world over, viz.:—Sodium nitrate, ammonium sulphate, dried blood, blood manure and nitro-chalk (nitrogenous), superphosphate and ground phosphate (phosphatic), sulphate and muriate of potash (potassic), and bone-dust and blood and bone (nitro-phosphatic).

The fertilizers to which reference has not been made, and which may be regarded as of lesser

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importance, both as regards output and value, are :—

Castor Meal, which is the disintegrated residue seed-covering of the castor oil bean after the oil has been extracted.

Wool Waste.—A by-product from the wool-scouring works, and which consists of the usual inert material mixed with weed seeds, wool and vegetable fibre.

"*A. and A. Nitrogenous Fertilizer,*" which is claimed to contain the residual fibre and complex organic compounds from skin fleshings, after the extraction of gelatine, mixed with treated scrap leather.

Humo-Phos.—A mixed fertilizer containing sulphate of ammonia and rock phosphate in a lime-peat base.

Mixed and Complete Fertilizers.

New mixtures appearing in the registrations for the first time are super and potash, and potash with blood and bone. The advent of the former is due to the improvement obtained when it is applied to pastoral land in certain areas in the southern part of the State, while the latter is in demand as a spring fertilizer on light soils under intense culture,

TABLE I.—QUANTITIES OF PLANT NUTRIENTS IN THE FORM OF COMMERCIAL FERTILIZERS APPLIED PER ACRE OF CROP AND PASTORAL LAND IN VARIOUS COUNTRIES.

Country.	Nitrogen.	Phosphoric Acid.	Potash.	Total.
	lb.	lb.	lb.	lb.
Holland ..	23·9	36·3	45·8	106
Belgium ..	26·3	32·6	25·0	83·9
Germany ..	13·6	16·4	26·8	56·8
Denmark ..	9·6	19·0	8·4	37·0
Norway ..	6·7	9·7	5·2	21·6
France	4·4	8·5	5·4	18·3
Switzerland ..	·8	12·7	3·3	16·8
Sweden ..	3·5	8·1	3·7	15·3
Great Britain ..	3·0	8·0	3·1	14·1
Italy	4·2	8·0	1·1	13·3
Czecho-Slovakia ..	2·4	5·2	2·2	9·8
Austria ..	1·4	2·5	2·1	6·0
Victoria ..	·14	4·5	·03	4·67
United States ..	1·1	2·0	1·1	4·2
Poland ..	·6	·8	·9	2·3
Roumania ..	·01	·05	·01	·07

The figures in Table I. were taken from the February (1937) issue of *Superphosphate*, with the exception of those for Victoria, which were computed by the author.

The increased demand for mixed and complete fertilizers is interesting, particularly in view of the fact that in Victoria the average ratio of the three

TABLE II.—PLANT FOOD RATIOS.

Country.	Nitrogen.	Phosphoric Acid.	Potash.
Holland	1	1·50	2·00
Belgium	1	1·25	1·00
Germany	1	1·25	2·00
Denmark	1	2·00	1·00
Norway	1	1·50	·80
France	1	2·00	1·25
Switzerland	1	16·00	4·00
Sweden	1	2·30	1·00
Great Britain	1	2·70	1·00
Italy	1	1·75	·25
Czecho-Slovakia ..	1	2·20	1·00
Austria	1	2·00	1·50
United States	1	2·00	1·00
Poland	1	1·30	1·50
Roumania	1	5·00	1·00
Victoria	1	32·00	·20

The ratios in Table II. were computed from the figures in Table I.

plant nutrients, viz. :—Nitrogen, phosphoric acid and potash, applied to the soil annually in the form of commercial fertilizers is of a very different order from that used in other countries. The figures set out in Tables I. and II. illustrate this point clearly.

From the figures in Table I. it will be observed that the average dressing of commercial fertilizers per acre varies from an ounce or two in Roumania, in which country it may be assumed artificial fertilizers are rarely used, to 106 lb., in Holland. The figure for Victoria, i.e., 4.67 lb. may be regarded as very low, but it should be remembered that it applies to all agricultural land (pastoral and crop) irrespective of whether the soil receives fertilizer or not. The same would apply to the figures for other countries, but the proportion of uncultivated and unmanured land would not be so extensive as in Victoria, which by comparison, is sparsely populated. It is of interest to note that Holland, Belgium, Germany and Denmark are countries where the farming community practises comparatively heavy manuring with the three main plant foods.

The plant food ratios given in Table II. definitely show the narrow ratio of the three main plant nutrients used in the form of commercial fertilizers by the farmer in other parts, and the very wide ratio used in Victoria. In other words, whereas the Victorian farmer practically relies upon phosphatic manuring to counter the proved deficiency of the soil in phosphoric acid, the average farmer in other countries resorts to combinations or complete fertilizers to obtain results in the field.

Between 4,000 and 5,000 tons of superphosphate, Victoria's main fertilizer, stored at a local manufacturer's works.

The figures in Table II. represent parts of plant food and the ratio they bear to each other—for example, for every pound of nitrogen in the form of artificial fertilizer used by the farmers of Holland, 1½ lb. of phosphoric acid and 2 lb. of potash are also used; in Great Britain the figures are 1 of nitrogen, 2¾ of phosphoric acid and 1 of potash, whereas in our own State we use 32 lb. of phosphoric acid and only 3 oz. of potash to 1 lb. of nitrogen. It will be noticed that Switzerland is a country which favours phosphatic-potassic manuring.

It is not suggested that any hard and fast rule can be observed in applying commercial fertilizers to the soil, excepting in the case of proved deficiency, i.e., phosphoric acid in cereal culture in Victoria. A casual investigation into the results of the analyses of typical Victorian soils discloses ratios of the three principal plant foods which vary from 1–1–1 (equal parts of nitrogen, phosphoric acid and potash) through all stages to 4–1–28 (4 parts of nitrogen to 1 part of phosphoric acid, to 28 parts of potash), and 12–1–4 (12 parts of nitrogen to 1 part of phosphoric acid to 4 parts of potash). These figures in themselves show ratios of potential fertility, which not only differ extensively, but in many cases these differences occur in the soils of the one farm.

Again, the ratios of plant food in the various farm products differ greatly, for example, milk contains the three plant nutrients, nitrogen, phosphoric acid and potash in the following ratio:—2¾–1–1 respectively, whereas the proportion in blood is 13–1–½ (the ratio in meat being somewhat similar). In cabbage the ratio is 3½–1–4, in parsnip 1–1–2¼, while in average pasture it is 4–1–3¼.

The ratios discussed mean nothing more than that (*a*) plant food ratios in soluble form based on the quantity of commercial fertilizers used in various countries only differ materially in the isolated cases of Switzerland and Victoria. (*b*) The ratios for plant food mainly insoluble and unavailable, determined by analysis of typical Victorian soils, are mainly very wide, and it may be assumed that the ratio of available plant food under mellow conditions would be somewhat similar. (*c*) The ratios of the three main plant foods in most of the produce sold off the farm, while they show definite differences, are for the most part narrow and closely approximate the ratios purchased by countries of the world when buying artificial fertilizer. (*d*) When considering ratios it should be remembered that nitrogen is the only plant food manufactured on the farm (per medium of leguminous plants) and that the

bulk of the produce which is sold off the farm contains plant nutrients in definite proportions, and which can only be replenished (i) by the culture of leguminous crops (nitrogen) and (ii) by the judicious use of artificial fertilizers.

Much has been done by research in delving into problems dealing with soil improvement and scientific manuring, but many years must elapse before the present system in Victoria, which in intense culture at any rate, is largely a matter of guesswork, is replaced by something more concrete. In the meantime a system based on experiment, observations and inference on the part of the intense culturist and applied to small areas, might be something worth while.

Unit Values.

The unit value of a plant nutrient in its varying forms is the commercial value of 1 per cent per ton —the calculation is applied to simple fertilizers only. For example, the value of 1 per cent. of the plant food nitrogen in the organic form as blood is 20s. 6d. per ton of fertilizer, but the same plant food in the form of nitrate in nitrate of soda, is obtainable at a cost of 17s. 4d. per ton, while as ammonia in sulphate of ammonia, the average price charged is 12s. for each 1 per cent. per ton of the fertilizer. The variation in value is primarily due to the cost of production.

While the cheapest form of nitrogen, i.e., as ammonia in sulphate of ammonia, may be assumed to be the best to use, the slower acting organic form as blood is very often preferred by intense culturists because of (*a*) the even and gradual nitrogen supply during the growing period, (*b*) the effect on the physical condition of the soil, and (*c*) the less likelihood of loss in drainage water.

A comparison between the unit values for 1938 and the current year discloses small variations. Slight increases have taken place in the unit value of ammoniacal and organic nitrogen, and in phosphoric acid as fine bone. Both forms of potash are dearer. The unit value system is of particular importance to the man on the land when contemplating the purchase of artificial fertilizer, but it can only be applied to comparisons between fertilizers of similar composition. For instance, the system should not be applied to obtain a comparison between the price per ton of sulphate of ammonia and potash sulphate. It may be applied, however in the case of tankage fertilizers (blood and bone), mixed and complete fertilizers, and any simple or compound fertilizer which is of organic origin.

The following example will serve to illustrate:—

Three fertilizers are registered under the heading of "nitrogenous—slowly available," viz., castor meal, wool waste, and A. and A. nitrogenous fertilizer. Which is the best value?:—

	£	*s.*	*d.*
Castor Meal—			
4·5 per cent. nitrogen as castor meal at 18s. 6d.	4	3	3
2·25 per cent. phosphoric acid as citrate insoluble at 2s. 2d. ..	0	4	10
·75 per cent. potash as sulphate at 6s. 4d.	0	4	9
	4	12	10
Wool Waste—			
3·85 per cent. nitrogen as organic (probably wool and vegetable fibre), at 18s. 6d.	3	11	3
·70 per cent. phosphoric acid as citrate insoluble at 2s. 2d. ..	0	1	6
·31 per cent. potash as sulphate, at 6s. 4d.	0	2	0
	3	14	9
A. and A. nitrogenous fertilizer—			
7·75 per cent. nitrogen organic as animal refuse and hydrolized leather, at 18s. 6d.	7	3	4

The nitrogen in the three fertilizers must be regarded as slow acting, and it is very questionable whether it has the same agricultural value as the nitrogen in coarser bone, but assuming that this is so, then the comparison is as follows:—

—	Calculated Value Per Ton.	Price Asked Per Ton.
	£ *s.* *d.*	£ *s.* *d.*
Castor meal	4 12 10	4 0 0
Wool waste	3 14 9	3 0 0
A and A nitrogenous fertilizer (containing leather) ..	7 3 4	9 0 0

The figures favour wool waste and castor meal in preference to the nitrogenous fertilizer, the retail price of which is approximately *thirty-seven shillings per ton above* the commercial value, whereas the retail price per ton of both castor meal and wool waste is approximately *thirteen shillings and fifteen shillings respectively below* the commercial value.

For further comparison and consideration, the following average values of the brands of blood and bone and blood manure which are on the market may prove of interest—

—	Average Calculated Commercial Value.	Average Price Asked Per Ton.
	£ s. d.	£ s. d.
Average blood and bone ..	8 7 6	7 19 2
Average blood manure ..	8 3 9	9 0 0

The average composition of the two fertilizers is :—

—	Nitrogen as Blood.	Phosphoric Acid Citrate Soluble.	Phosphoric Acid Citrate Insoluble.	Potash as Sulphate.
	Per cent.	Per cent.	Per cent.	Per cent.
Blood and bone	5·50	5·82	8·14	..
Blood manure ..	7·71	·7	·7	·08

Applying the system to the new mixed fertilizer "super. and potash" which consists of three parts of superphosphate to one part of potash chloride, the method is to multiply the guaranteed percentage of a plant food by its unit value figure, therefore—

Per cent. of plant food—	£ s. d.
15·40 water soluble phosphoric acid × 3s. 7d. (Unit value) ..	= 2 15 2
0·30 citrate soluble phosphoric acid × 3s. (Unit value) ..	= 0 1 0
0·80 citrate insoluble phosphoric acid × 2s 2d. (Unit value)	= 0 1 8
12·50 potash as chloride × 5s. 4d. (Unit value)	= 3 6 8
Calculated value per ton ..	= 6 4 6

The registered retail price is £6 15s. per ton, which is 10s. 6d. per ton higher than the calculated value. This is actually the price charged for mixing re-handling, &c.

While the majority of the fertilizers in the list have similar analyses and registered prices, the fact remains that in some cases a unit value calculation and comparison is well worth while.

Tubercle Free Herds

The following herds have been declared free of tuberculosis under the scheme conducted by the Department of Agriculture. Under this scheme a tuberculosis-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests, or, upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

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Herd Number.	Name.	Address.	Number in Herd.	Herd Number.	Name.	Address.	Number in Herd.
1	State Research Farm	Werribee ..	259	10	Banyule Stud Pty. Ltd.	Heidelberg ..	122
2	Warragul High School	Warragul ..	35				
3	Payne, A. E. T. ..	"Yarra View," Lilydale	80	11	McIntosh, John ..	"Burnwood," Merrigum	31
4	Dennis, Mrs. A. A. ..	Frankston ..	14	12	Black, Mrs. Agnes ..	Mount Noorat	40
5	Lady Talbot Milk Supply Company	Cranbourne ..	418	13	Black, I. S. ..	"The Cottage," Mount Noorat	44
6	Reid, Ralph G. ..	"Holmwood," Koo-wee-rup	99	14	Read, John D. ..	"Springhurst Estate," Springhurst	99
7	Harris, J. W. ..	"Rowena," Clyde	72	15	Kelly, C. ..	"Glenmore," Creighton's Creek, Euroa	22
8	School of Horticulture	Burnley ..	8				
9	Lawrence, P. H. ..	"Rainga," Tarrawarra	59	16	Gorman, A. W.	"Cathcart," Alexandra	57

By A. W. Jessep, M.Agr.Sc., B.Sc., Dip.Ed., Principal, School of Horticulture, Burnley.

Garden Notes.

OWING to the recent prolonged dry spell, it has been necessary to constantly water, weed, hoe and mulch the garden. The seedlings which have survived the adverse conditions have been hardened off, and if reasonable rains fall in early autumn, they should develop into very sturdy plants with a profusion of blooms.

There is still time to plant out gladioli, dahlias, iris, and lilies. Seeds of antirrhinum, ageratum, French marigold, Iceland poppies, carnations, calendula, stock, foxglove, and Canterbury bell may still be sown.

Cultivate the ground in preparation for planting next month such bulbous plants as grape hyacinth, daffodil, sparaxis and watsonia. Also replace any casualties that may have occurred amongst the seedlings already planted out. Remove dead blooms from the roses and cut them back to a vigorous bud. Tie up the dahlia plants and remove any faded blooms so as to prolong the flowering period.

Rock Gardens.—During recent years, rock gardens have increased very much in popularity, and if placed in a suitable situation they greatly add to the beauty of the garden. They must be as naturalistic in form as possible; therefore an open site should be chosen well away from the house and trees. The ideal position is on a sloping sunny bank, in the middle or at one side of the garden, where it may be transformed into natural-looking hillside scenery.

Making of the Rockery.—First remove about a foot of the top soil, and fill in the excavation with clinkers, broken bricks, and rubble to assist the drainage. The type of rock is immaterial, but it must be well weather-worn. Do not use too much rock. A small number of big stones is more advantageous than many small ones. Partly bury them, leaving about two-thirds of each stone above ground. Set firmly in position, and in such a way as to leave pockets in which to grow the desired plants. About 7 yards of rock and 6 yards of soil would be sufficient to build a fair-sized rockery, say one about 18 feet by 14 feet, and reaching to a height of about 4 feet in the centre.

Paths and steps are necessary in a rock garden, and they should be built in such a manner as to lead to the outstanding plants. The soil should be of a light type, easily drained, and should contain a moderate amount of fibrous

material, such as well-decayed straw or cow manure. As the requirements of the different plants are varied, so the soil should be varied by the addition of lime or peat.

If the ground is inclined to be of a sticky nature, some coarse sand and charcoal should be worked in, as it is essential that the soil be loose, pliable and nourishing. Arrangement is most important, and a variety of plants should be selected for contrast, proportion and balance. Bushes and dwarf trees are used to provide a solid foundation as well as a sense of maturity. Dwarf conifers may be introduced to suggest height and variety of level, also for greenery in the winter. Broad level areas may be covered with mossy saxifragas, dwarf phlox, dwarf dianthus and miniature bulbs, whilst the crevices may be planted with primulas, primroses, saxifragas, house leeks, &c.

The larger rocks should be covered with such plants as prostrate junipers or cotoneasters. If rampant trailing plants are desired, the pig-faces, lotus, erigeron and cerastium may be used. The number of plants which may be grown on a rockery is enormous, and it must be remembered that the appearance will depend on the attention one is prepared to give them. It is of little use growing the small choice plants if rampant ones be allowed to choke them out.

For the beginner, the following list for selection may be found helpful :—

Bushlike Conifers.—Retinospora ericoides, Retinospora leptoclada, Retinospora squarrosa, Biota orientalis, Thuya occidentalis globosa.

Bushy Plants .— Berberis Thunbergia atropurpurea, Berberis Corryii, Cotoneaster microphylla, Punica Granatum nana (the pomegranate), Veronica hulkeana (the Speedwell), Felicia Angustifolia, Camellia sasangua, Lavender, Eriostemon (native wax flower), Fuchsia gracilis.

Prostrate Shrubs.—Juniperus prostrata (Juniper), Rosmarinus prostratus (Rosemary), Cotoneaster horizontalis, Cotoneaster praecox, Eriocephalus, Jasminium nudiflorum, Lantana sellowiana, Helianthemum (Sun Rose).

Carpet Plants.—Acaena microphylla (New Zealand burr), Thymus serphyllum (thyme), Lippia nodiflora (fog fruit), Helzine, Hermiana, Epilobium (willow herb).

Plants that require little attention.—Erigeron (flea bane), Alyssum (sweet Alice), Ajuga (bugle flower), Cerastium (snow in summer), pig faces, Veronica (The Speedwell), Nepeta (cat mint), Arabis (rock cress), Cherianthus (alpine wallflower).

Plants easily grown but require more attention.—Sedums (stone crop), Sempervivums (house leek), Silene (catch fly), phlox, Scutellaria (skull cap),

Portion of the rock garden at Burnley Gardens.

Lotus (bird's foot trefoil), Linaria (toad flax), Campanula (bell flower), dianthus (pink), Aubretia, Armeria (The Thrift), Lychins (Campion).

As some Victorian nurserymen are specializing in rock garden plants, it would be advisable for those interested in this type of garden to obtain descriptive catalogues from them.

Vegetables.

Vegetables in growth during the summer should not be allowed to get too dry, and require regular attention. After each watering, run the hoe over the ground to form a soil mulch. The soil surrounding beans, potatoes, and such crops should be well ridged up to the stems to give support against strong winds.

To obtain good crisp leaves from such crops as lettuce their growth must be unchecked. Dry weather is making this difficult, and careful watering and hoeing are essential.

Make further sowings of French and climbing beans, lettuce, peas, turnips, silver beet, cabbages and cauliflowers. Prepare the ground in readiness for planting out cabbage, cauliflower, celery and Brussel sprouts next month. Such vegetables as beans, peas, and cucumbers must be picked regularly, otherwise the plants will soon begin to die off.

The radish is an essential culinary vegetable for mixed salads. It is one of the quickest growing plants, and is fit for use at any time from three to seven weeks after the seed has been sown. To obtain crisp and tender roots, force them along in a well-prepared soil and do not let their growth be checked. Use them before they have finished growing; when they mature they become tough and pithy. After thoroughly preparing the bed, sow the seeds thinly in rows about 9 to 15 inches apart, and cover them with not more than half an inch of fine soil. Thin out the young seedlings later, and use the surplus ones for salads. Make several different sowings to ensure a continuous supply from spring until late autumn.

Fortunately, the radish is comparatively free from the attacks of pests, but sometimes aphis is prevalent in the early spring. If so, give a dusting with nictar or spray with any of the approved aphis controls.

Radishes vary in shape and are usually classified as long, intermediate, olive or turnip, according to the shape of the root. White Wonder is a good early white turnip variety. White Early Red is a good red turnip variety. French Breakfast is a very popular olive or oval-shaped variety. Long Scarlet is a good long variety and Icicle is a good long white variety.

Orchard Notes

By J. L. Provan, B.Agr.Sc., Senior Horticultural Instructor.

MANY varieties of fruit are picked during January, but particularly apricots and peaches. The later varieties of apricots to be harvested include Tilton, Mansfield, Trevatt, Alsace, and some Moorparks. Choice varieties of dessert peaches such as Zerbe's, Pump's, Ireland's, Noonan's, Smith's, and Bendigo Beauty, will also be picked, and the most popular canning pear—William's—will be harvested for the fresh fruit market and for cannery purposes. Some early European and Japanese plums will also be harvested, and towards the end of the month canning peaches, such as Tuscan and Levis, will mature.

Growers should not make the mistake of picking plums and peaches in an immature condition if they are intended for local storage or export. The correct stage to pick plums and peaches is when the flesh and ground colour have changed to a whitish-green, and a very slight softening has taken place. Mature peaches are usually distinguished by the development of a blush, but this characteristic cannot be used in determining the maturity of the blue and red varieties of plums, because many of these are fully blushed when only partly grown. Recent experiments with the cool storage of plums have demonstrated that mature plums will store for a considerable period if placed in a temperature of 32° F., and then later transferred to the minimum ripening temperature, which varies from 40° to 46° F. Plums may be kept for from 8 to 18 weeks in storage according to the variety to be stored; for example, the Satsuma plum has a storage life of only 8 weeks, while Cole's Golden Gage has been successfully stored for 18 weeks. Similar results have been obtained with the storage of mature peaches; the minimum ripening temperature with this fruit varies from 45° to 55° F. according to the variety. An Instructional Circular, dealing with the cool storage of plums and peaches, is available free on application to the Director, Department of Agriculture, Melbourne, C.2.

[*Continued on page 52.*

Professional Papers

[This section is devoted to professional papers and articles of a scientific character.]

Intergeneric Hybridization

A preliminary note of investigations on the use of Colchicine in Inducing Fertility.

By A. R. Raw, M.Agr.Sc., Cereal Geneticist.

THE demonstration, by Blakeslee, Avery, Nebel, and Ruttle, of the action of the alkaloid colchicine upon the chromosome mechanism of the plant and animal cell, furnishes what is probably the most outstanding cytogenetic advance in recent years. The comparative ease and certainty with which polyploidy may be induced indicates the possibilities which the discovery of the action of this drug has opened up to the plant breeder. The fact that a very large proportion of our economic plants are polyploids, furnishes very definite evidence of the value of these discoveries.

Apart from the undoubted significance of the artificial induction of polyploidy within a variety or species, there is the wider, and genetically more important aspect—the possible induction of fertility in normally sterile interspecific, and intergeneric hybrids. Up to the present, the exploitation of such fields by the plant breeder has been strictly limited by the sterility factor. The discovery of a method by which this factor could be eliminated would therefore be of inestimable value to the plant breeder.

It is the purpose of this paper to record the successful induction of complete fertility, in the normally totally sterile intergeneric hybrid, *Triticum vulgare* x *Agropyrum intermedium*, by the action of colchicine.

The investigations with colchicine were conducted at the State Research Farm, Werribee, Victoria, during 1938. The drug was employed in concentrations of 0·1, 0·2, 0·3, 0·4, 0·6 and 1·0 per cent., the period of treatment varying from six to 240 hours. It was found that the higher levels of concentration and treatment were invariably fatal to seed or young shoots. For seed treatments, a 0·2 per cent. concentration for a period of 96 hours proved to be the most satisfactory, while the same concentration for periods of less than 24 hours gave the best results in the treatment of young shoots.

***Triticum vulgare* x *Agropyrum intermedium*—an F_1 plant—totally sterile.**

The investigations embraced members of the following genera—Triticum, Hordeum, Avena, Pisum, Dianthus, and Calendula, and included the hybrids *Triticum vulgare* x *T. dicoccum*, *T. vulgare* x *T. orientale*, *T. vulgare* x *T. durum*, *T. vulgare* x *T. turgidum*, *Triticum vulgare* x *Aegilops*

Showing dwarfing action of colchicine. (Triticum vulgare x Agropyrum intermedium hybrid.) Left, untreated; right, treated with colchicine 0.2 per cent.

ovata, and *T. vulgare* x *Agropyrum intermedium*. As the investigations are as yet incomplete, reference in this paper is confined to the effect of the alkaloid upon the hybrids of Triticum and Agropyrum.

Hybrid grains of the *Triticum vulgare* x *Agropyrum intermedium* mating were immersed in 0·2 and 0·4 per cent. concentrations of colchicine for 96 hours. After treatment, grains were allowed to develop on moist cotton wool for seven days, when they were transferred to pots. The immediate effect of the drug was to cause a marked lateral swelling of the plumule with associated distortion and enlargement of the cells. Growth was definitely retarded, and root formation inhibited. Seedling mortality was exceptionally high, and such plants as survived were dwarfed and have, as yet failed to produce ears, though untreated plants have already matured.

In addition to the seed treatments, a number of stools of a sterile F_1 hybrid of Triticum and Agropyrum were subjected to the action of the drug. This hybrid was produced in 1936 as the result of a mating between *Triticum vulgare* and a pubescent chaffed race of *Agropyrum intermedium*. In growth characters the hybrid resembled the Agropyrum parent. The plant was procumbent in habit, and produced an excessively large number of stools. The resemblance extended to the morphological characters of the foliage. Leaf margins were ciliate and the leaf blade was flattened, and did not exhibit the prominent midribs of the wheat parent. The upper surface of the blade was scabrous. The period from germination to heading was similar to that of the Agropyrum parent. The hybrid was taller than either parent, and produced an extraordinarily large number of ears. The ear was long, very lax, tapering and awnless, the glumes being white and glabrous. The spikelet was typically three-flowered, the flower parts being well developed and apparently normal in appearance. The hybrid was completely sterile.

During the autumn of 1938 the plant was cut back, and the crown divided into single stools. Stools were immersed in water until shoot formation commenced. Shot stools were immersed in colchicine concentrations of 0.2 and 0.4 per cent. for periods ranging from six to 48 hours. Control shoots were kept in water under similar conditions. After treatment, stools were washed and transferred to water for seven days prior to being planted. The treated shoots typically showed a marked swelling at the base, and cell enlargement and distortion were again apparent. Growth was slow, and, as was the case with treated seed, root development was retarded, and mortality

Plants of the T. vulgare x A. intermedium hybrid at a later stage than that shown in the previous illustration. The dwarfing action is still apparent. (Left, untreated; right, colchicine 0.2 per cent.

high. Later development of the plants was more normal, but in no case approached that of members of the untreated series. All controls, and all but one of the treated plants were completely sterile.

Among the treated plants one proved to be fully fertile. This plant, which was subjected to treatment for ten hours in a 0.2 per cent. solution, resembled the sterile control plants and the original F_1 in all visible characters except fertility. Cytological examination of the plant is not yet completed, and until such data are available, the exact nature of its fertility cannot be determined. It is probable, however, that the chromosome balance of the organism has been restored, and it is apparent that such restoration has been brought about by the action of the narcotic, colchicine.

It is believed that this furnishes the first recorded case of the successful use of colchicine in inducing fertility in normally sterile intergeneric hybrids.

References.

Blakeslee, A. F. and Avery, A. G. (1937) "Methods of Inducing Doubling of Chromosomes in Plants." Journal Heredity, XXVIII., 12.

Nebel, B. R. and Ruttle, M. L. (1938).—The Cytological and Genetical Significance of Colchicine. Journal Heredity, XXIX., I.

Orchard and Garden Notes

(*continued from page* 49).

Towards the end of January passion fruit will be harvested in the northern districts, and in picking this fruit care must be taken to prevent shrivelling. It requires to be gathered daily, preferably in the early morning or the late afternoon, and the fruit should always be handled very carefully to prevent skin damage. When picking, the stalks should be broken just above the dead flower and the picked fruit immediately placed in a cool and sheltered place. A recent development, which may be of great assistance to passion fruit growers, is the use of wax emulsions to prevent shrivelling of the fruit. The fruit is dipped in these emulsions and a fine wax film remains on the fruit preventing the normal transpiration of moisture from the skin.

The continued dry weather for the past three or four months has been particularly favorable to the development of red spider. Growers who are experiencing trouble with this pest should include one pint of nicotine sulphate to each vat of lead arsenate or white oil spray, and pay particular attention to the spraying of the underside of the leaves. Jassids, which have been prevalent in several fruit districts in recent years, may again give trouble this year, and as the second brood appears during January it is advisable to watch very closely for the early signs of this insect. The spray, recommended above for red spider, will also effectively control this pest.

William's pear trees and Gravenstein apple trees will require "strawing" early this month. The provision of a good layer of straw beneath the trees will protect windfalls from damage and dust.

January is a particularly favourable month for fumigation for the control of red scale on citrus trees. The advantage of early fumigation is that the dead scale falls from the fruit, and prospects are better for a clean crop at harvest time. Where red scale infestations are heavy, fumigations can be followed by oil spraying, using summer white oil emulsion, 1 gallon in 40 gallons of water. Liquid HCN is again being tried as a fumigant. The new form of liquid HCN has been stabilized by the addition of chemicals and is transported in steel cylinders, thus overcoming the application problems which previously hampered its use under northern Victorian conditions.

Where brown and black scales are prevalent on citrus trees, an application of white oil emulsion spray 1 in 40 should be applied when the majority of the eggs have hatched. These scales, unlike red scale, are oviparous (i.e., they lay eggs), and generally fumigation, unless performed when very few eggs are about, is not effective in controlling these pests.

The attention of fruit growers is directed to the article in this issue of the Journal dealing with the registration and unit values of fertilizers. A careful study of the composition of the various fertilizers will assist growers to purchase the most economic and suitable fertilizer for their purpose. (See Supplement).

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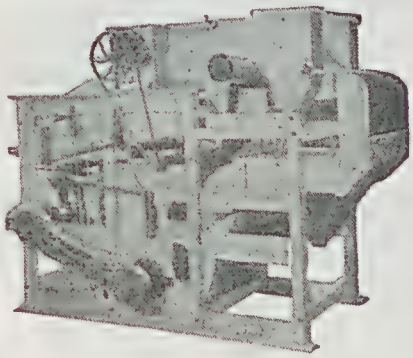

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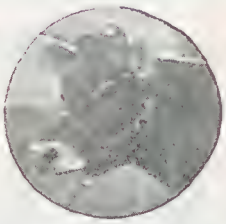

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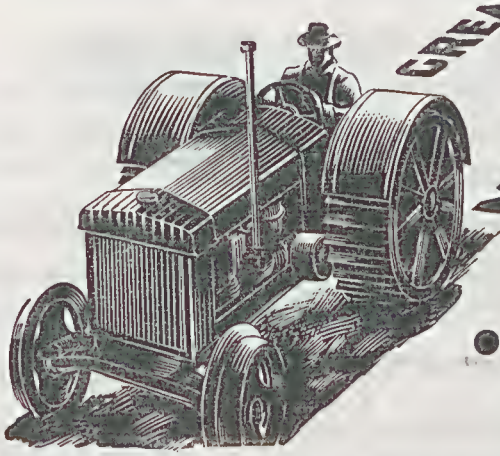

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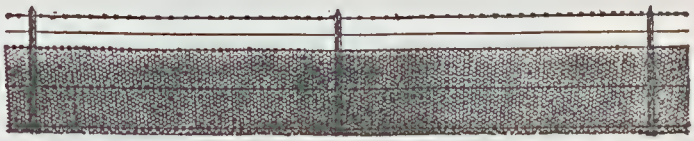

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„ as Ammonia	0	12	0
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as Water Soluble	0	3	7
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in Blood and Bone and Animal Fertilizers and in Mixed and Complete Fertilizers containing either or both of the foregoing	0	4	6
in all other Fertilizers	0	3	0
as Citrate Insoluble—			
in Blood and Bone and Animal Fertilizers, and in Mixed and Complete Fertilizers containing either or both of the foregoing	0	3	6
in other Mixed Fertilizers and in Ground Phosphate	0	2	2
in other Fertilizers	0	1	0
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as Coarse Bone	0	4	0
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as Sulphate	0	6	4
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		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Nitrogenous—Readily Available.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Nitrate of Soda	Sickle in diamond	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco ..	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	Cresco Fertilizers Ltd., Geelong
„ „	Pivot ..	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
	Champion ..	16·00	..	..	..	..	16·00	..	..	..	..	..	13 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
„	Pratt's Champion	15·50	..	..	..	..	15·50	..	..	..	..	..	13 10 0	T. D. Pratt and Co. Pty. Ltd., Victoria Market, Melbourne
Sulphate of Ammonia	M.G. Co. in diamond	..	20·59	..	..	..	20·59	..	..	..	..	..	12 8 0	The Metropolitan Gas Co., 196 Flinders-st., Melbourne
„ „	Pivot ..	..	20·60	..	..	..	20·60	..	..	..	..	..	12 8 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne

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		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
Nitrogenous—Readily Available—continued.		%	%	%	%	%	%	%	%	%	%	%				
Sulphate of Ammonia	Sickle in diamond	..	20·60	..	..	..	20·60	..	..	..	..	..	12	8	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Cresco ..	..	20·60	..	..	..	20·60	..	..	..	..	..	12	8	0	Cresco Fertilizers Ltd., Geelong
Nitro Chalk† ..	Sickle in diamond	7·75	7·75	..	..	..	15·50	..	..	..	..	..	12	8	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Moderately Available.																
Dried Blood ..	Imperial in diamond	..	..	12·00	..	..	12·00	..	..	..	..	..	12	0	0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
" " ..	T.B. & S. in diamond—Brooklyn	..	..	12·00	..	..	12·00	..	..	..	..	..	13	10	0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne
" " ..	M.C.C. ..	..	..	11·50	..	..	11·50	..	..	..	..	..	10	6	0	Melbourne City Council, Town Hall, Melbourne
" " ..	Pannifex's ..	..	..	12·00	..	..	12·00	..	..	..	..	..	12	10	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
" " ..	Pannifex's Blood Flour	..	..	13·00	..	..	13·00	..	..	..	..	..	12	10	0	
Blood Manure .	Sickle in diamond	..	..	7·50	..	..	7·50	..	..	..	..	..	9	0	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" " ..	Nifex ..	..	..	7·50	..	..	7·50	..	..	1·00	1·00	·25	8	10	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
" " ..	Pentagon ..	..	..	8·13	..	..	8·13	..	2·07	1·13	3·20	..	9	10	0	Western District Tallow Pty. Ltd., North-rd., East Oakleigh
Slowly Available.																
Castor Meal ..	Alba ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	0·75	4	5	0	Lycett Proprietary Ltd., Normanby-road, Montague
" " ..	Pannifex' ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4	0	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
" " ..	Sweetsoil ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4	0	0	Sweetsoil Lime and Fertilizers Pty. Ltd., 17 Queen-st., Melbourne
" " ..	L.F.X. ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	Lawford's Fruit Exchange Pty. Ltd., Doncaster
Wool Waste ..	A.L.T. ..	..	..	..	..	..	3·85 (unspecified)	..	..	·70	·70	·31	3	0	0	A. L. Thompson Pty. Ltd., 49 Grant-st., South Melbourne
Nitrogenous Fertilizer	A. and A. ..	..	..	.	6·25 As animal refuse.	1·5 As hydro-disedleather	7·75	..	..	..	..	..	9	0	0	Est. G. W. Pennell, Burke-st., Braybrook
Phosphatic—Readily Available.																
Superphosphate 22 per cent.	Cresco ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	Cresco Fertilizers Ltd., Geelong
" "	Sickle in diamond	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
" "	Lamaco ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-st., Melbourne
" "	Cockbill's ..	..	..	..	..	..	..	20·50	·50	1·00	22·00	..	3	15	0	W. and J. Cockbill (trading as J. Cockbill), 407 Post Office-place, Melbourne

† This fertilizer contains approximately 50 per cent. Lime.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3630) FOR THE YEAR 1939—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Phosphate—Moderately Available.																
Basic Phosphate	Sickle in diamond	..	..	..	..	..	..	..	15·50	3·20	18·70	..	4	15	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot ..	..	..	..	..	..	..	..	15·50	3·00	18·50	..	4	15	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Super. and Rock Phosphate	Pivot ..	..	..	..	..	..	..	10·00	·50	18·50	29·00	..	4	5	0	,, ,, ,,
,, ,,	Cresco 50·50 Phosphate	..	..	..	..	..	..	9·16	1·84	17·40	28·40	..	4	5	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Sickle in diamond	..	..	..	..	..	..	10·00	·50	18·50	29·00	..	4	5	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Slowly Available.																
Ground Phosphate	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	36·65	36·65	..	4	0	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	36·50	36·50	..	3	15	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot (very fine)	..	..	..	..	..	..	..	..	36·50	36·50	..	4	0	0	,, ,, ,,
Potassic—Readily Available.																
Sulphate of Potash	Cresco ..	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	Cresco Fertilizers Ltd., Geelong
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Sickle in diamond (90%)	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st, Melbourne
,, ,,	Pannifex's ..	..	..	..	..	..	..	..	..	..	..	48·50	15	7	6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Sun	..	..	..	..	..	..	..	..	..	..	48·6	15	7	6	Mildura Co-op. Fruit Packing Co. Ltd., Mildura
Muriate of Potash	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	..	..	50·0 (as chloride)	13	7	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Cresco ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	13	7	6	Cresco Fertilizers Ltd., Geelong
,, ,,	Pannifex's ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	13	7	6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Unity ..	..	..	..	..	..	..	..	..	..	..	51·0 (as chloride)	13	7	6	T. E. Butler, 486 Collins-st., Melbourne
Containing Nitrogen and Phosphoric Acid—Readily Available.																
Super. and Ammonia	Cresco (1 and 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	8	12	6	Cresco Fertilizer Ltd., Geelong
,, ,,	Cresco (2 and 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	7	5	0	,, ,, ,,
,, ,,	Cresco (3 and 1)	..	5·00	..	..	..	5·00	15·37	..	1·13	16·50	..	6	10	0	,, ,, ,,
,, ,,	Cresco (6 and 1)	..	2·85	..	..	..	2·85	17·48	·42	·85	18·75	..	5	12	6	,, ,, ,,
,, ,,	Pivot III. ..	..	10·00	..	..	..	10·00	10·20	·20	·50	10·90	..	8	12	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot II. (A) ..	..	6·80	..	..	..	6·80	13·60	·30	·60	14·50	..	7	5	0	,, ,, ,,
,, ,,	Pivot II. ..	..	5·00	..	..	..	5·00	15·30	·30	·80	16·40	..	6	10	0	,, ,, ,,
,, ,,	Pivot I. ..	..	2·90	..	..	..	2·90	17·40	·40	·80	18·60	..	5	12	6	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1939—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Containing Nitrogen and Phosphoric Acid—Readily Available—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Super. and Ammonia	Sickle in diamond (1 and 1)	..	10·30	..	..	..	10·30	10·25	·25	·50	11·00	..	8 12 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Sickle in diamond (2 and 1)	..	6·87	..	..	..	6·87	13·66	·34	·66	14·66	..	7 5 0	" " "
" "	Sickle in diamond (3 and 1)	..	5·00	..	..	..	5·00	15·40	·30	·80	16·50	..	6 10 6	" " "
" "	Sickle in diamond (6 and 1)	..	2·90	..	..	..	2·90	17·50	·40	·90	18·80	..	5 12 6	" " "
Nitro Superphosphate	Sickle in diamond	..	1·50	..	..	·50	2·00	16·70	1·10	2·00	19·80	..	6 0 0	" " "
" "	Cresco ..	..	1·50	..	·50	..	2·00	16·39	1·10	1·70	19·19	..	6 0 0	Cresco Fertilizers Ltd., Geelong
Moderately Available.														
Ammonia and Rock Phosphate	Cresco ..	..	2·00	..	..	..	2·00	8·30	1·60	15·70	25·60	..	5 7 6	" " "
" "	Sickle in diamond	..	2·00	..	..	..	2·00	8·20	·20	18·90	27·30	..	5 7 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Blood, Bone, and Super.	Sickle in diamond	..	..	..	..	2·50	2·50	12·51	1·43	2·96	16·90	..	6 12 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Cockbill's ..	..	..	..	2·50	..	2·50	12·51	1·43	2·96	16·90	..	8 7 6	W. and J. Cockbill (trading as J. Cockbill), 407 Post Office-place, Melbourne
" "	Pannifex's ..	..	..	..	..	2·50	2·50	10·25	3·25	4·00	17·50	..	6 12 6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Bone and Super.	Dundas' ..	..	..	..	..	2·25	2·25	9·99	5·16	5·58	20·73	..	7 10 0	J. A. Dundas, Dynon-rd., Footscray
" "	Sickle in diamond, No. 1	..	..	..	..	2·00	2·00	11·40	3·00	5·30	19·70	..	6 15 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	G.B.P. ..	..	..	..	1·72	..	1·72	10·00	6·00	6·00	22·00	..	6 17 6	Gippsland Bone Products, Ronchi Bros., Raymond-st., Sale
" "	Cresco No. 1 ..	..	..	..	2·00	..	2·00	9·50	3·90	3·00	16·40	..	6 15 0	Cresco Fertilizers Ltd., Geelong
" "	Pannifex's ..	..	..	..	..	1·75	1·75	10·25	4·25	5·50	20·00	..	6 15 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Super. and Bone	Cresco No. 2 ..	..	..	..	..	1·00	1·00	16·10	1·10	3·60	20·80	..	5 17 6	Cresco Fertilizers Ltd., Geelong
" "	Sickle in diamond, No. 2	..	..	..	..	1·00	1·00	17·00	1·40	1·90	20·30	..	5 17 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pannifex's ..	..	..	..	..	·90	·90	15·25	2·25	3·50	21·00	..	5 17 6	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
Blood and Bone	Sickle in diamond	..	..	..	..	5·00	5·00	..	5·00	9·00	14·00	..	8 0 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	J. A. Dundas'	..	..	..	..	4·50	4·50	..	7·14	13·61	20·75	..	8 0 0	J. A. Dundas, Dynon-rd., Footscray
" "	Corio ..	..	..	..	4·00	..	4·00	..	6·00	8·00	14·00	..	6 10 0	The Corio Trading Co. Pty. Ltd., 164 Moorabool-street, Geelong
" "	Cockbill's ..	..	..	..	..	5·25	5·25	..	3·00	9·00	12·00	..	9 10 0	W. and J. Cockbill (trading as J. Cockbill), 407 Post Office-place, Melbourne
" "	Imperial in diamond	..	..	..	4·50	..	4·50	..	6·00	12·00	18·00	..	7 10 0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
" "	W. & M. in circle	..	..	..	5·00	..	5·00	..	4·50	7·50	12·00	..	7 0 0	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1939—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*	Where Obtainable
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen and Phosphoric Acid.—Moderately Available — continued.														
Blood and Bone	Pridham's ..	..	..	..	5·40	..	5·40	..	8·50	5·50	14·00	..	7 0 0	W. Pridham Pty. Ltd., Evans-st., Braybrook
,, ,,	Ibis	..	..	..	..	4·60	4·60	..	9·27	8·63	17·90	..	7 0 0	Ficken, Halliday and McClelland Pty. Ltd., 634 Bourke-st., Melbourne
,,	P.M. ..	..	..	..	..	7·00	7·00	..	6·31	5·69	12·00	..	9 0 0	J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne
,, ,,	Solo ..	..	..	..	..	7·00	7·00	..	4·25	10·75	15·00	..	9 0 0	,, ,, ,,
,, ,,	Cockatoo ..	..	..	..	4·56	..	4·56	..	5·90	5·88	11·78	..	6 0 0	R. Fordham, Cressy-rd., Camperdown
,, ,,	Champion No. 2	..	..	..	7·00	..	7·00	..	3·20	10·20	13·40	..	9 0 0	Sims Cooper (Freezing Works) Pty. Ltd., Henty House, 499 Lit. Collins-st., Melbourne
,, ,,	Champion No. 4	..	..	..	6·50	..	6·50	..	6·50	7·50	14·00	..	8 10 0	,, ,, ,,
,, ,,	Fitzgerald's ..	..	..	..	5·00	..	5·00	..	5·50	9·50	15·00	..	7 10 0	P. Fitzgerald and Sons, Oakleigh
,, ,,	T.B. and S. in diamond (Lighthouse)	..	..	..	6·00	..	6·00	..	5·00	5·00	10·00	..	8 10 0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-st., Melbourne
,, ,,	T.B. and S. in diamond (Brooklyn)	..	..	..	5·75	..	5·75	..	5·75	6·00	11·75	..	8 10 0	,, ,, ,,
,, ,,	Eclipse ..	..	..	..	..	2·98	2·98	..	9·96	6·86	16·82	..	7 0 0	T. A. Mills, Spec. Gully, Golden Square
,, ,,	Apex ..	..	..	..	..	5·00	5·00	..	5·00	10·00	15·00	..	7 10 0	North-Eastern Bone Products, Wangaratta
,, ,,	Fitzgerald's (animal fertilizer)	..	..	..	3·70	..	3·70	..	6·10	13·50	19·60	..	7 10 0	P. Fitzgerald and Sons, Oakleigh
,, ,,	Pannifex's No. 1	..	..	..	..	5·50	5·50	..	8·00	6·00	14·00	..	8 0 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Pannifex's No. 2	..	..	..	..	7·00	7·00	..	5·00	6·00	11·00	..	9 0 0	,, ,, ,,
,, ,,	Pannifex's No. 3	..	..	..	..	5·50	5·50	..	5·00	10·00	15·00	..	8 0 0	,, ,, ,,
,, ,,	Pannifex's No. 4	..	..	..	..	6·00	6·00	..	5·00	7·00	12·00	..	8 0 0	,, ,, ,,
,, ,,	Pannifex's No. 5	..	..	..	..	8·00	8·00	..	3·00	5·00	8·00	..	9 0 0	,, ,, ,,
,, ,,	Pannifex's No. 6	..	..	..	..	6·00	6·00	..	6·00	10·00	16·00	..	8 10 0	,, ,, ,,
,, ,,	Pannifex's No. 7	..	..	..	..	4·00	4·00	..	7·00	9·00	16·00	..	7 10 0	,, ,, ,,
,, ,,	Pannifex's No. 8	..	..	..	..	4·50	4·50	..	6·00	10·00	16·00	..	7 15 0	,, ,, ,,
,, ,,	Pannifex's No. 9	..	..	..	..	7·00	7·00	..	4·00	5·00	9·00	..	9 0 0	,, ,, ,,
,, ,,	Pannifex's No. 10	..	..	..	..	7·50	7·50	..	6·31	5·69	12·00	..	9 0 0	,, ,, ,,
,, ,,	Pannifex's No. 14	..	..	..	..	5·00	5·00	..	6·00	8·00	14·00	..	8 0 0	,, ,, ,,
,, ,,	Pannifex's No. 15	..	..	..	..	7·00	7·00	..	6·00	8·00	14·00	..	9 0 0	,, ,, ,,
,, ,,	Cresco ..	..	..	..	..	7·00	7·00	..	6·50	7·50	14·00	..	9 0 0	Cresco Fertilizers Ltd., Geelong
,, ,,	F.F.M. in diamond A.B.	..	..	..	..	5·50	5·50	..	8·50	5·50	14·00	..	7 10 0	F. F. MacDermott Pty. Ltd., 54 Market-st., Melbourne
,, ,,	Bendigonian in circle	..	..	..	4·50	..	4·50	..	5·00	10·50	15·50	..	7 10 0	Bendigo Fertilizer and Wool Co. Pty. Ltd., View Point, Bendigo
,, ,,	Tongala ..	..	..	..	..	4·36	4·36	..	6·25	6·84	13·00	..	6 10 0	L. L. Russell and Son, Tongala
,, ,,	Horse ..	..	..	..	..	3·97	3·97	..	6·34	12·11	18·45	..	7 0 0	Numurkah New By-products Co., Numurkah West
,, ,,	Sickle in diamond, No. 2	..	..	..	..	7·25	7·25	..	6·00	7·00	13·00	..	9 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sayer ..	..	..	..	4·70	..	4·70	..	7·63	10·47	18·10	..	7 10 0	Sayer Co. (Aust.) Pty. Ltd., Laverton
,, ,,	Valley ..	..	..	..	..	7·0	7·00	..	3·00	2·20	5·20	..	7 0 0	Goulburn Valley Freezing Works, Shepparton
,, ,,	Sidney Lyall's	..	..	..	..	5·0	5·00	..	6·00	8·00	14·00	..	7 10 0	Sidney Lyall, Victoria Market, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1939—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Containing Nitrogen and Phosphoric Acid.—Moderately Available — continued.																
Blood and Bone	A.N.A. Surprise	..	..	..	..	5·00	5·00	..	4·00	10·00	14·00	..	8	0	0	G. W. Pennell, Burke-st., Braybrook
Bone Fertilizer..	Newnham's ..	..	..	..	..	..	2·28 (as bone)	..	6·86	16·72	23·58	..	5	0	0	Newnham Pty. Ltd., Box 8, P.O., Sale
Mixed Manure	Humo-Phos. ..	..	1·28	..	..	1·03 (organic)	2·31	..	..	5·46	5·46	..	4	0	0	Peninsula Lime and Fertilizer Co., 70 Elizabeth-st., Melbourne
Containing Phosphoric Acid and Potash Readily Available.																
Super. and Potash	Sickle in diamond (S.P. Super. and Potash)	..	..	..	..	..	..	15·40	·30	·80	16·50	12·50 (as muriate)	6	15	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Cresco (3 and 1)	..	..	..	..	..	..	15·38	·37	·75	16·50	12·5 (as muriate)	6	15	0	Cresco Fertilizers Ltd., Geelong
Containing Nitrogen, Phosphoric Acid and Potash																
Complete Manure	Sickle, No. 1 ..	..	1·00	..	..	1·40	2·40	12·50	1·70	2·10	16·30	5·00 (as muriate)	7	10	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond, No. 2	..	1·00	..	..	1·00	2·00	14·80	·40	·70	15·90	4·80	7	2	6	,, ,, ,,
,, ,,	Sickle in diamond (Market Garden)	..	1·70	..	..	1·50	3·20	11·50	2·50	3·10	17·10	2·42	7	17	6	,, ,, ,,
,, ,,	Sickle in diamond (A) (5.1.1.)	..	2·90	..	..	..	2·90	14·60	·40	·70	15·70	6·90	7	5	0	,, ,, ,,
,, ,,	Sickle in diamond (B) (5.2.1.)	..	5·00	..	..	..	5·00	12·80	·30	·60	13·70	6·00	8	4	0	,, ,, ,,
,, ,,	Sickle in diamond (C) (4.4.1.)	..	9·15	..	..	..	9·15	9·11	·22	·44	9·77	5·39	9	11	6	,, ,, ,,
,, ,,	Sickle in diamond (D) (2.2.1.)	..	8·24	..	..	..	8·24	8·20	·20	·40	8·80	10·00 (unspecified)	10	2	0	,, ,, ,,
,,	Pivot IV. ..	..	2·90	..	..	..	2·90	14·30	·30	·70	15·30	6·90	7	5	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot V. ..	..	8·20	..	..	..	8·20	8·20	·20	·40	8·80	9·60	10	2	0	,, ,, ,,
,, ,,	Pivot VI. ..	..	9·10	..	..	..	9·10	9·10	·20	·40	9·70	5·30	9	11	6	,, ,, ,,
,, ,,	Cresco No. 1 ..	..	1·00	..	1·40	..	2·40	11·25	2·00	4·50	17·75	5·00	7	10	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco (Market Garden)	..	1·50	..	1·56	..	3·06	11·65	1·49	3·26	16·40	2·42	7	17	6	,, ,, ,,
,, ,,	Cresco, No. 2 ..	..	9·15	..	..	..	9·15	9·11	·22	·44	9·77	5·39	9	11	6	,, ,, ,,
,, ,,	Cresco, No. 3 ..	..	5·15	..	..	..	5·15	12·81	·31	·63	13·75	6·06	8	4	0	,, ,, ,,
,, ,,	Cresco, No. 4 ..	..	8·24	..	..	..	8·24	8·20	·20	·40	8·80	10·00 (as muriate)	10	2	0	,, ,, ,,
,, ,,	Pannifex's ..	..	8·24	..	..	..	8·24	8·20	·20	·40	8·8	10·0 (unspecified)	10	2	0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
,, ,,	Pannifex's (Potash and Blood and Bone)	..	..	..	..	4·00	4·00	..	5·00	6·00	11·00	9·75	10	10	0	,, ,, ,,
,, ,,	Pannifex's (Market Garden)	..	1·70	..	..	1·50	3·20	11·50	2·50	3·00	17·00	2·40 (unspecified)	7	17	6	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1939.

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.*	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Benedust ..	Pannifex's No. 1	1·00	30·00	95·0	5·0	8 10 0	H. C. Pannifex and Co. Pty. Ltd., 4 Dudley-st., Melbourne
" ..	Pannifex's No. 2	3·50	19·00	50·0	50·0	8 5 0	" " " "
" ..	G.B.P. ..	3·44	24·00	65·0	35·0	8 10 0	Gippsland Bone Products, Raymond-st., Sale "
" ..	Mount Clear ..	3·00	19·10	50·0	50·0	7 0 0	Bailey Bros., 6 Sturt-st., Ballarat
" ..	Nuelife ..	3·50	22·00	50·0	50·0	7 15 0	E. F. Peters and Sons Pty. Ltd., Dunolly
" ..	Pioneer ..	4·07	22·01	50·0	50·0	7 10 0	W. A. Rainey, Mepunga East
" ..	Apex ..	3·25	20·00	50·0	50·0	7 10 0	North-Eastern Bone Products, Wangaratta
" ..	Eclipse ..	3·27	24·59	69·4	30·6	7 0 0	T. A. Mills, Spec Gully, Golden Square
" ..	Corio ..	2·00	20·00	51·5	48·5	6 10 0	The Corio Trading Co. Pty. Ltd., 164 Moorabool-st., Geelong

* F.O.R. at Melbourne or Railway Station nearest place of manufacture.

Melbourne, 21st November, 1938.

W. R. JEWELL, M.Sc., F.I.C.,
Chemist for Agriculture.

Butter Production and Export

The following table shows:—

(*a*) Factory production of butter and cheese in Victoria for the period July to October, 1938, compared with the corresponding period of 1937.

(*b*) Quantities and percentages of various grades of bulk butter examined in Victoria for export during the period July to November, 1938, in comparison with the corresponding period of 1937.

FACTORY PRODUCTION OF BUTTER AND CHEESE IN VICTORIA (QUANTITIES IN TONS).

Month.	Butter.		Cheese.	
	1938.	1937.	1938.	1937.
July	2,165	2,336	289	259
August	3,502 (*)	3,557	439 (*)	394
September	5,626 (*)	5,999	863 (*)	719
October	7,730 (*)	8,823	1,507 (*)	1,020
Totals—4 Months	19,023*	20,715	3,098*	2,392

* Subject to revision.

BULK BUTTER EXAMINED IN VICTORIA FOR EXPORT (QUANTITIES IN TONS).

Month.	1938.					Month.	1937.				
	How Graded—				Total.		How Graded—				Total.
	Ch.	1st.	2nd.	Pty.			Ch.	1st.	2nd.	Pty.	
July to October	6,606	1,504	353	19	8,482	July to October	7,586	1,757	402	17	9,762
November ..	3,896	1,071	240	15	5,222	November ..	4,469	2,228	335	22	7,054
Totals—5 Months ..	10,502	2,575	593	34	13,704	Totals—5 Months..	12,055	3,985	737	39	16,816
Percentages ..	76·6	18·8	4·3	0·3	..	Percentages ..	71·7	23·7	4·4	0·2	..